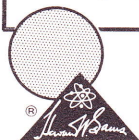


PHOTOFACT® Folder



REVERE MODELS T-2000, T-2200,
TS-2005, TS-2025, TS-2205, TS-2225

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REVERE MODELS T-2000, T-2200,
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GENERAL INFORMATION

Revere Models T-2000, TS-2005, TS-2025, T-2200, TS-2205, and TS-2225 tape recorders are basically alike in design and operation. The Record, Stop, and Play functions are electrically and mechanically controlled by a single three-position Function knob. This is automatically stopped at the end of its travel while in either the Play or Record mode.

See "Description of Models" for the major differences between models. The illustrations used in the manual are of Model T-2200.

Recordings can be made from a radio, phonograph, or television as well as those made directly from the microphone.

Manufactured By:

Revere Camera Company
320 East Twenty-First Street
Chicago 16, Illinois

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana



The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of CQ484

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DESCRIPTION OF MODELS

Models T-2000, TS-2005, and TS-2025 are monaural units and comprise the Series T-2000 recorders. Models T-2200, TS-2205, and TS-2225 are stereo units and comprise the Series T-2200 recorders. All models are dual speed recorders which operate at 3 3/4 or 7 1/2 inches per second. The main differences between models are as follows:

Model T-2000

Monaural version only--Records or plays monaural, 2 (or twin) - track tapes. Designed to operate from a power source that supplies 105-120 VAC at 60 cycles per second.

Model TS-2005

Same as Model T-2000 except that recorder is designed to operate from a power source that supplies 105-120 VAC at 50 cycles per second.

Model TS-2025 (Export Model)

Same as Model T-2000 except that recorder is designed to operate from a power source that supplies either 105-120 VAC at 50 cycles per second, or 240 VAC at 50 cycles per second.

Model T-2200

Stereo and monaural versions

1. Records and plays monaural, 2 (or twin) - track tapes.
2. Records and plays monaural, 4 separate tracks.
3. Records and plays stereo, 2-track tapes.
4. Records and plays stereo, 4-track tapes.

Model T-2200 is designed to operate from a power source that supplies 105-120 VAC at 60 cycles per second.

Model TS-2205

Same as Model T-2200 except that recorder is designed to operate from a power source that supplies 105-120 VAC at 50 cycles per second.

Model TS-2225 (Export Model)

Same as Model T-2200 except that recorder is designed to operate from a power source that supplies either 105-120 VAC at 50 cycles per second, or 240 VAC at 50 cycles per second.

SPECIFICATIONS

FREQUENCY RESPONSE:

Series T-2000 recorders-

- 40-15,000 cps \pm 3db at 7 1/2 ips.
- 40-8,000 cps \pm 3db at 3 3/4 ips.

Series T-2200 recorders (both channels)-

- 40-18,000 cps \pm 3db at 7 1/2 ips.
- 40-13,000 cps \pm 3db at 3 3/4 ips.

WOW AND FLUTTER:

Less than .3% for both speeds.

SIGNAL-TO-NOISE RATIO

Greater than 46db.

TAPE SPEEDS

3 3/4 and 7 1/2 ips.

PLAYING TIMES

A. Series T-2000 recorders

1. Monaural record or play of twin track tapes.
 - a. 3 hours with 1 mil tape, 7" reel, at 3 3/4 ips (1 1/2 hours each track).
 - b. 1 1/2 hours with 1 mil tape, 7" reel, at 7 1/2 ips (3/4 hour each track).
 - c. Playing times are 1/3 less with standard 1 1/2 mil tape.

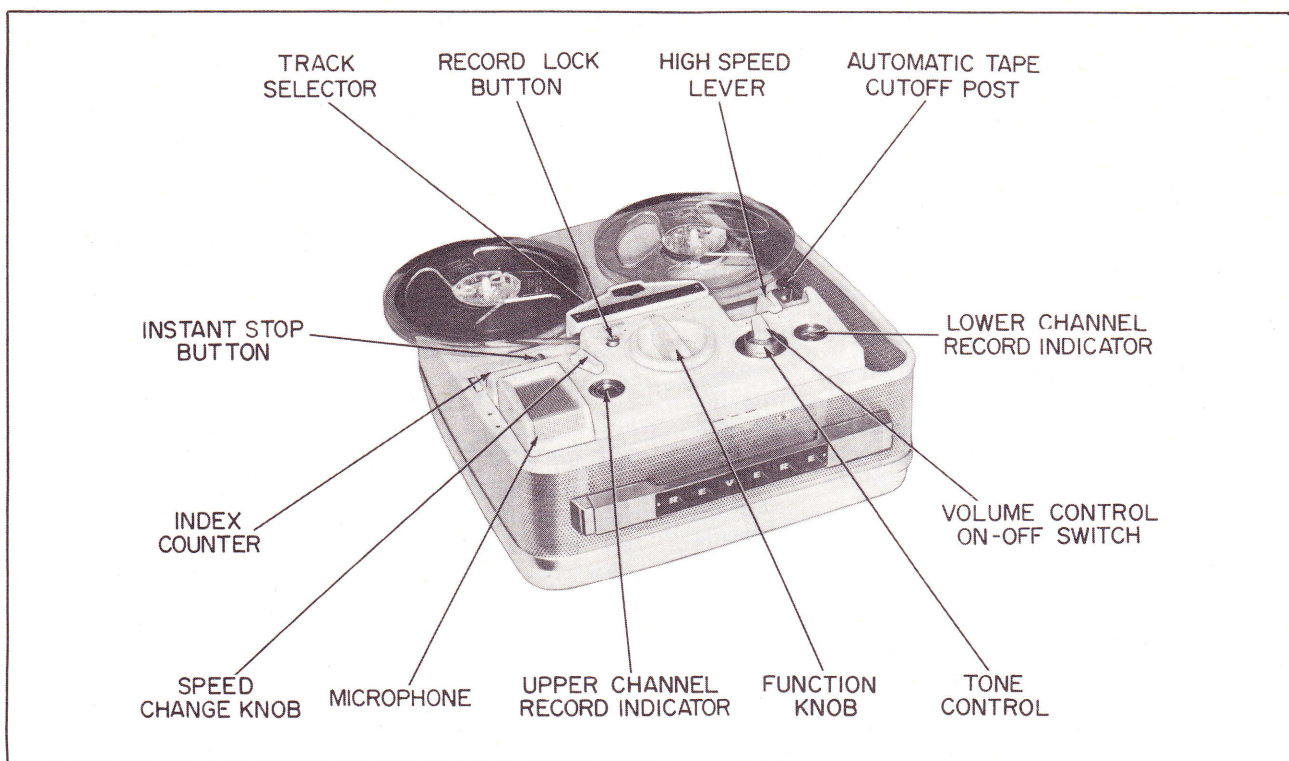


Fig. 1. Tape Recorder Controls

B. Series T-2200 recorders

1. Monaural record or play of twin track tapes.

Same as steps A-1a, A-1b, and A-1c.

2. Stereo record or play of twin track tapes.

a. 1 1/2 hours with 1 mil tape, 7" reel, at 3 3/4 ips.

b. 3/4 hour with 1 mil tape, 7" reel, at 7 1/2 ips.

c. Playing times are 1/3 less with standard 1 1/2 mil tapes.

3. Stereo record or play of 4-track tapes.

Same as steps A-1a, A-1b, and A-1c.

4. Monaural record or play of 4 separate tracks.

Provides playing times up to 6 hours with a 1 mil tape, 7" reel, at 3 3/4 ips, (1 1/2 hours each track). Playing times are 1/3 less with standard 1 1/2 mil tape.

INPUTS:

A. Series T-2000 Recorders

1. Microphone input (short plug), 10-megohms impedance, 2-millivolts signal level.

2. Radio-phono input (long plug), 1-megohm impedance, 1-volt signal level.

B. Series T-2200 Recorders

1. Upper channel

a. Microphone input (short plug), 10-megohms impedance, 2-millivolts signal level.

b. Radio-phono input (long plug), 1-megohm impedance, 1-volt signal level.

2. Lower Channel

3-16 ohms impedance, 1-volt signal level.

POWER OUTPUT:

8 watts maximum.

SIGNAL FROM LOWER CHANNEL PREAMP OUTPUT:

Series T-2200 recorders only — (0.5 to 1.5 volts.)

CROSSTALK:

Series T-2200 recorders only — (-50db)

TRACK WIDTH:

Series T-2000 recorders — .090" wide

Series T-2200 recorders — .043" wide

POWER CONSUMPTION:

80 watts

SIZE:

Approximately 7 1/2" x 14" x 14 1/2"

WEIGHT:

25 lbs.

POWER REQUIREMENTS:

Refer to nameplate at rear of recorder case.

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TS-2005, TS-2025, TS-2205, TS-2225

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FUNCTIONS OF PRINCIPAL PARTS (REFER TO FIG. 1)

Volume Control (For Upper Channel Only) and On-Off Switch

Clockwise rotation of the Volume knob supplies power to the entire recorder and simultaneously regulates the volume for both the recording and playback operations. Turning the recorder On also automatically unlocks the transport mechanism so that the Function knob may be turned to engage the Record or Play mode.

NOTE: The automatic tape cutoff switch is electrically connected in series with the power On-Off switch and must be held in the closed position before power is supplied to the recorders. The tape cutoff switch is held in the closed position when either the Function knob is returned to the Stop position, or when the tape has been threaded on the machine for use in the Record or Play mode. Engagement of the Rewind or Rapid Forward mode returns the Function knob to the Stop position, and thus mechanically holds the cutoff switch in the closed position without interference by the tape.

Tone Control

Clockwise rotation of the Tone knob regulates the tone for playback and public address operations only. The Tone control is disconnected when recording.

Function Knob

All electrical and mechanical functions for Record, Stop, and Play modes are performed by this single, 3-position knob.

Stop Mode—Turning the Function knob to the Stop position returns the mechanism and associated amplifier circuitry to the normal or rest position from a prevailing engagement of either the Record or Play mode. Also for convenience and protection, a prevailing engagement of the Record or Play mode is automatically returned to the Stop position whenever the On-Off switch is turned Off, thereby again disengaging the mechanism from the Play or Record mode. With the Function knob in the Stop position, the recorder may be used as a public address system.

Record Mode—Turning the Function knob to the Record position actuates the mechanism and switches the electrical circuits that enables the material available at the input jack to be recorded. The Record Lock Button must first be depressed before the Record mode can be engaged. The Record mode cannot be engaged if the recorder is already engaged in either the Rewind or Fast Forward mode - the High Speed Lever must first be returned to its neutral (center) position before the Record mode can be engaged.

Play Mode—Turning the Function knob to the Play position actuates the mechanism and switches the electrical circuits necessary to properly play back a recorded tape. The Play mode, like the Record mode, cannot be engaged if the recorder happens to be engaged

in either the Rewind or Fast Forward mode — the High Speed Lever must first be returned to its neutral (center) position before the Play mode can be engaged.

High Speed Lever

This lever controls the high speed transport of the tape in both the Rewind and Fast Forward modes. It can be used to skip ahead to any point on the tape or to rewind tape onto the supply reel. By moving the lever back and forth, the tape can be inched along in either direction to find an exact point on the tape.

Rewind Mode—Sliding the High Speed lever to the left acts upon mechanical linkages in such a way as to cause high speed transport of the tape onto the supply reel. The Rewind mode can be engaged while the recorder is engaged in the Record, Stop, or Play mode. The previously engaged mode (either Play or Record) automatically releases and returns the Function knob to the Stop position. To switch from Rewind to the Fast Forward mode, the High Speed lever must first be moved to its center position to allow the brakes to stop the rewind travel of the tape. The High Speed lever may then be moved to the right to engage the Rapid Forward mode.

Rapid Forward Mode—Sliding the High Speed lever to the right acts upon mechanical linkages in such a way as to cause high speed transport of the tape onto the take-up reel. The Fast Forward mode can be engaged while the recorder is engaged in the Record, Stop, or Play mode. The previously engaged mode (either Play or Record) automatically releases and returns the Function knob to the Stop position. To switch from Fast Forward to the Rewind mode, the High Speed lever must first be moved to its center position to allow the brakes to stop the fast forward travel of the tape. The High Speed lever may then be moved to the left to engage the Rewind mode.

Instant Stop Button

Pushing this button acts mechanically upon the mechanism to stop the tape travel while in functions of Record or Play. Examples of its use are: to prevent recording of unwanted breaks in radio programs, to noiselessly hold back the tape for instantaneous starts in either Record or Play, to precisely preset the record level while in the Record mode, and to momentarily stop tape in transcribing. The Instant Stop is inoperative in functions of Rapid Forward and Rewind.

Record Lock Button

This button acts as a safety device and prevents the Function knob from engaging the Record mode, thus guarding recordings from accidental erasure. To make a recording the button must first be depressed before the Function knob can engage the Record mode. The button is reset whenever the Function knob returns to the Stop position.

Speed Change Knob

Operation of this knob selects either 3 3/4 ips or 7 1/2 ips tape speeds while the recorder is engaged

in any function. Rapid Forward winding can be accelerated by selecting the 7 1/2 ips tape speed. The fidelity on 7 1/2 ips selection is greater insofar as recording and reproducing are concerned.

Record Level Indicators

Series T-2000 Recorders — With the combination play/record-erase head used in Series T-2000 recorders, the Record Level indicator (labeled "Record Level") is used to give a visual analysis of the correct volume setting for the recording of monaural 2 (or twin) - track tapes. The left or "Normal" half of the indicator flashes to indicate a correct volume level, and the right or "Distort" half of the indicator flashes when the volume level is too high. The proper recording level may be preset with the recorder in either the Stop or Record functions. If the volume level for recording is preset in the Stop position, the Tone control should be turned to "Treble." The Tone control has no effect on the record level in the Record function.

Series T-2200 Recorders — Two Record Level indicators are used in Series T-2200 recorders — one is labeled "Upper Channel Record Level" and the other is labeled "Lower Channel Record Level." The Upper Channel Record Level indicator is the same indicator that is used in the T-2000 Series. However, with the separate stereo in-line head used in the T-2200 Series, the indicator is used to give a visual analysis of the correct volume setting for the recording of:

1. Monaural 2 (or twin) - track tapes.
2. Monaural 4-track tapes.
3. Upper channel of stereo 2-track tapes.
4. Upper channel of stereo 4-track tapes.

The operation of the Upper Channel Record Level indicator is the same as that described above for Series T-2000 recorders.

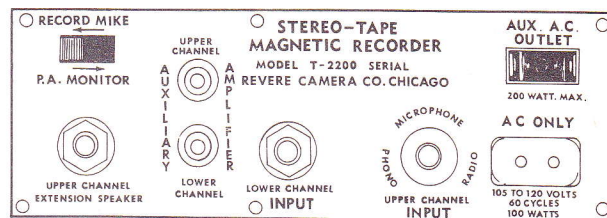
The Lower Channel Record Level indicator is used to give a visual analysis of the correct volume setting for the recording of the lower channel on stereo 2-track and 4-track tapes. The volume control on the external stereo amplifier should be adjusted so that the "Normal" half of the indicator flashes, and no flashing occurs at the "Distorted" half.

Index Counter

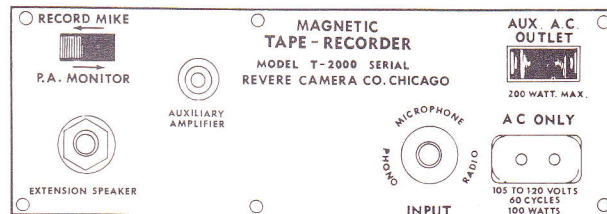
Set the counter to zero by turning its knob toward the front of the recorder when starting to record or playback a reel of tape. If the reading of the counter is noted at various points in the tape travel, new program selections can be indexed, or previously recorded selections can be located with great accuracy.

Head Track Selector (Series T-2200 Recorders Only)

The head track selector knob moves the head assemblies up or down to properly orient the heads for the monaural record/playback and stereo record/playback operations. Refer to the "Operating Instructions", page 6.



A. Series T-2200



B. Series T-2000

Fig. 2. Rear Panel Connections

Automatic Feature of Tape Cutoff

This feature is controlled by a weighted pin which moves into a slot in the cutoff post when the tape runs out between the post and pin while in functions of Play or Record. Movement of the pin into the cutoff post opens the tape cutoff switch which interrupts power to the recorder, and thus turns it Off. To turn on the recorder after automatic cutoff, the Function knob must be turned to the Stop position. The tape can then be rethreaded on the machine. If desired, the tape cutoff feature can be made inoperative by placing a piece of tape over the slot in the cutoff post. The automatic end of tape cutoff is inoperative in the Rewind and Rapid Forward modes.

Rear Panel Connections (See Fig. 2)

Input (Series T-2000 Recorders) — The Input jack in these recorders is designed to connect the audio signals from a microphone, a phonograph, a radio, or some other suitable source, to the recorder for the purpose of making monaural recordings of 2 (or twin) - track tapes. The proper input circuit is automatically selected by the different lengths of input plugs. The shorter (1") plug is used with the microphone and a 1 3/16" plug is used for the radio or phono connections.

Input (Series T-2200 Recorders) — Two Input jacks are used in Series T-2200 recorders — one is labeled "Upper Channel Input" and the other is labeled "Lower Channel Input." The Upper Channel Input jack is identical to the Input jack that is used in the T-2000 Series. However, with the separate stereo in-line head used in the T-2200 Series, the Input jack is used to connect the program material to the recorder for the purpose of recording:

1. Monaural 2 (or twin) - track tapes.
2. Monaural 4-track tapes.
3. Upper channel of stereo 2-track tapes.
4. Upper channel of stereo 4-track tapes.

The Lower Channel Input jack is designed to operate from a low-impedance output transformer (3 to

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16 ohms) of a radio, television, phonograph, auxiliary amplifier, or any other stereo appliance. The Input jack connects the program material to the recorder for the purpose of recording the lower channel of stereo 2-track and 4-track tapes.

P.A./Monitor - Record Mike—This is a slide switch which controls the output of the speaker in either the Stop (P.A.) or Record functions. With the switch in the Record Mike position, the speaker is silenced in functions of Record or Stop. With the switch in the P.A./Monitor position, the speaker is connected so that the recorder may be used as a public address system in the Stop function, or so that the program material can be monitored in the Record function. In Series T-2000 recorders, the monaural recording of 2-track tapes can be monitored. In Series T-2200 recorders, both the monaural recording of 2-track and 4-track tapes, and the stereo recording on the upper channel of 2-track and 4-track tapes can be monitored. The switch has no control of the speaker in the Play function.

Extension Speaker—This jack is labeled "Extension Speaker" in Series T-2000 recorders and "Upper Channel Extension Speaker" in Series T-2200 recorders. These jacks are identical, the only difference being their application in the different recorders.

The jack provides a connection for an external speaker or head phones. The nominal impedance of the external speaker should be 8 ohms, but speakers of impedance ranging from 3.2 to 16 ohms may be used with only a slight loss of power. Accessories, such as the TE-401 ear phones may also be used. The associated connecting plug of the external speaker or phones will automatically disconnect the speaker in the recorder. The external speaker duplicates the functions of the internal speaker.

In Series T-2000 recorders, the Extension Speaker jack delivers the output from monaural 2-track tapes. In Series T-2200 recorders, the Upper Channel

Extension Speaker jack delivers the output from monaural 2-track and monaural 4-track tapes, and/or the upper channel output from stereo 2-track or 4-track tapes.

Auxiliary Amplifier (Series T-2000 Recorders)—This jack is used in conjunction with the Play function of the recorder. In Series T-2000 recorders, the Auxiliary Amplifier jack may be used to deliver the preamplified output from monaural 2-track tapes to an external Hi - Fi system for further amplification and control.

Auxiliary Amplifier (Series T-2200 Recorders)—Two Auxiliary Amplifier jacks are used in Series T-2200 recorders—one is labeled "Upper Channel" and the other is labeled "Lower Channel". Both jacks may be used in conjunction with the Play function of the recorder. The Upper Channel jack is identical to the Auxiliary Amplifier jack used in the T-2000 Series. However, with the separate stereo in-line head used in the T-2200 Series, the upper channel jack may be used to deliver the preamplified output from monaural 2-track and monaural 4-track tapes, and/or the preamplified output of the upper channel from stereo 2-track or 4-track tapes to an external Hi - Fi system for further amplification and control.

The Lower Channel jack may be used to feed the preamplified lower channel output of stereo 2-track and 4-track tapes to an external Hi - Fi system for further amplification and control.

Aux. A.C. Outlet—This power outlet can be used to control the power to any appliance (radio, television, phonograph, etc.) that doesn't require more than 200 watts. Power to the outlet is controlled by the automatic tape cutoff switch. Power is applied to the outlet when the Function knob is in the Stop position, or when the tape has been threaded on the machine for use in functions of Record or Play. Examples of the outlet's use are to turn off power to a radio tuner or auxiliary Hi - Fi system at the end of the tape.

OPERATING INSTRUCTIONS

Plug the male end of the power cord into an AC electric outlet that delivers the power requirements as specified on the nameplate at the rear of the recorder. Plug the female end of the power cord into the rear of the recorder. Turn Volume knob clockwise to On position.

Threading the Tape (Refer to Fig. 1)

1. Turn Function knob to Stop position.
2. Place a full reel of tape (use type "A" wind tape—glossy side out) on the left spindle.
3. Pull a length of tape off the supply reel and lower it into the threading slot.
4. Thread the tape between the tape cutoff post and cutoff pin and attach the end of the tape to the empty take-up reel.
5. Zero the index counter for a future reference.

To Make and Play Back a Monaural Two (or Twin) - Track Recording

The material for a monaural recording may be supplied from a microphone, a radio or television, a phonograph, an external amplifier, etc. Regardless of the source of material, it must be fed by the proper input plug into the proper Input jack at the rear of the recorder.

1. To record:
 - a. Turn the Function knob to the Stop position and thread the machine. In Series T-2200 recorders, it is further necessary to turn the head track selector knob to the "2-Track" position. This action moves the heads in a position with respect to the tape as shown in Fig. 3.

- b. Turn the Speed Change knob to the desired tape speed, either 3 3/4 or 7 1/2 ips.
- c. Turn the Tone control to "Treble" and set the slide switch at the rear of the recorder to the Record Mike position.
- d. Insert the input signal at the rear of the recorder into the jack labeled "Input" in Series T-2000 recorders, or into the jack labeled "Upper Channel Input" in Series T-2200 recorders.
- e. Observe Record Level indicator at left of Function knob, and adjust Volume control so that the "Normal" half of the Record Level indicator flashes, and no flashing occurs at the "Distorted" half.
- f. Depress the Record Lock Button and turn the Function knob to the Record position. The recording will start. Observe the Record Level indicator again, and if necessary readjust Volume control for normal flashing.

- g. After the recording of the first track is completed and tape runs out, turn the Function knob to the Stop position.

- h. To record the second track, remove the empty supply reel from the left spindle. Take the full reel of tape from the right spindle, turn it over, place it on the left spindle, and rethread the machine.

- i. Record the second track in the same manner as the first track.

2. To play back:

- a. With the Function knob in the Stop position, place the recorded reel of tape on the left spindle and thread the machine. In Series T-2200 recorders, make sure that the head track selector knob is turned to the "2-Track" position.
- b. Turn the Function knob to the Play position. Adjust the Volume and Tone controls for the desired listening pleasure.
- c. After the playback of one track is completed and tape runs out, turn the Function knob to the Stop position.
- d. To playback the second track remove the empty supply reel from the left spindle. Take the full reel of tape from the right spindle, turn it over, place it on the left spindle, and rethread the tape.
- e. Turn the Function knob to the Play position and play back the second track.

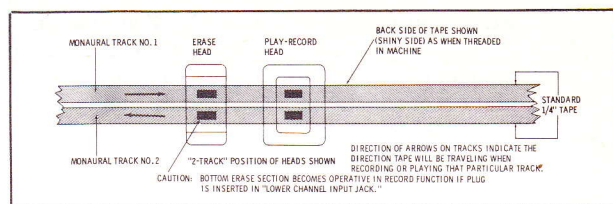


Fig. 3. "2-Track" Position of Heads Shown for Monaural Record or Playback Operations

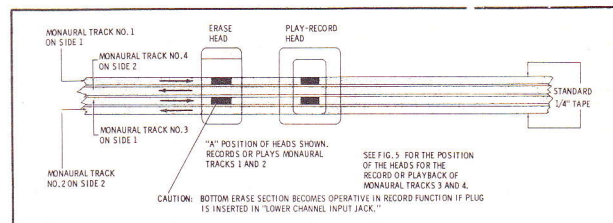


Fig. 4. "A" Position of Heads Shown

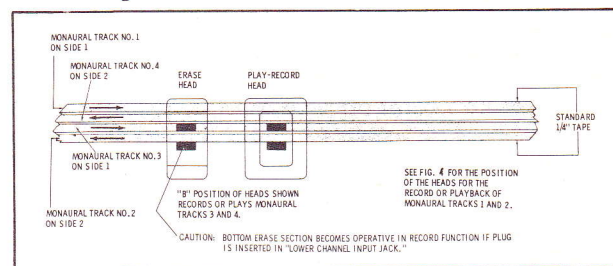


Fig. 5. "B" Position of Heads Shown

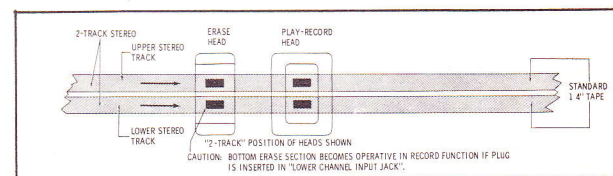


Fig. 6. "2-Track" Position of Heads Shown for Stereo 2-Track Record or Playback

To Record or Play Four Separate Monaural Tracks (Series T-2200 Recorders Only)

The basic operations for the record and playback of 4-track monaural tapes are the same as the record and playback of monaural 2 (or twin) - track tapes. However, for the record or playback of 4-track monaural tapes, the head track selector knob must be turned to positions "A" and "B". To record or play 4 separate monaural tracks, proceed as follows:

1. Arbitrarily designate by a label or some other means, "Side 1" to one of the sides of both the supply and take-up reels and "Side 2" to the remaining two sides. Place both the supply and take-up reels on their respective spindles with "Side 1" up. Thread the machine.
2. Place the head track selector knob in the "A" position. This action moves the heads in position with respect to the tape as shown in Fig. 4.
3. To record or play track No. 1 on "Side 1", turn the Function knob to the desired position.

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4. At the end of the reel, turn the Function knob to the Stop position. Take the full reel from the right spindle, turn it over to "Side 2", and place it on the left spindle. Place empty take-up reel on right spindle with "Side 2" up. Thread the machine.
5. To record or play track No. 2 on "Side 2", turn the Function knob to the desired position.
6. At the end of the reel, turn the Function knob to the Stop position. Turn the head track selector knob to the "B" position. This action moves the heads in a position with respect to the tape as shown in Fig. 5.
7. Take the full reel from the right spindle, turn it over to "Side 1", and place it on the left spindle. Place empty take-up reel on right spindle with "Side 1" up. Thread the machine.
8. To record or play track No. 3 on "Side 1", turn the Function knob to the desired position.
9. At the end of the reel, turn the Function knob to the Stop position. Take the full reel from the right spindle, turn it over to "Side 2", and place it on the left spindle. Place empty take-up reel on right spindle with "Side 2" up. Thread the machine.
10. To record or play track No. 4 on "Side 2", turn the Function knob to the desired position. This completes the record or playback of 4 separate monaural tracks.

A simplified chart of the above procedure is located in the case cover.

To Record or Play Stereo 2 - Track Tapes (Series T-2200 Recorders Only)

Stereo 2-track tapes contain one full length recording on the dull side of the tape. To record or play a stereo 2-track tape, proceed as follows:

1. To record from a radio, television, auxiliary amplifier, or phonograph.
 - a. Turn the Function knob to the stop position and thread the machine.
 - b. Turn the head track selector knob to the "2-Track" position. This action moves the heads in a position with respect to the tape as shown in Fig. 6.
 - c. Turn the Speed Change knob to the desired tape speed.
 - d. Turn the recorder's Tone control to "Treble" and set the slide switch at the rear of the recorder to the Record Mike position.
 - e. Insert the input signals from the output terminals (such as speaker terminals, output transformer terminals, preamp output jack, etc.) of the stereo

sound-producing appliance into their respective input jacks at the rear of the recorder. The output from the left channel of the stereo appliance should be connected to the Upper Channel Input jack. The output from the right channel of the stereo appliance should be connected to the Lower Channel Input jack.

- f. The input signal fed to the Upper Channel Input jack is preamplified by the recorder before it is recorded on the tape. This being the case the signal fed to the Upper Channel Input jack may be of a signal level as low as 2 millivolts.

The input signal fed to the Lower Channel Input jack is not preamplified by the recorder before it is recorded on the tape. This being the case the signal fed to the Lower Channel Input jack must be preamplified to a signal level of at least 1 volt by the external stereo appliance. To also match the input impedance of the Lower Channel Input jack, the output impedance from the right channel of the stereo appliance should be within the range of 3 to 16 ohms.

- g. Adjust volume control on left channel of stereo appliance for normal listening level. Thereafter, adjust the Volume control on the recorder so that the "Normal" half of the Upper Channel Record Level indicator flashes, and no flashing occurs at the "Distorted" half.

Adjust Volume control on right channel of stereo appliance so that the "Normal" half of the Lower Channel Record Level indicator flashes, and no flashing occurs at the "Distorted" half.

- h. Depress the Record Lock Button and turn the Function knob to the Record position. The recording will start. Observe both Record Level indicators again, and if necessary readjust the proper Volume control for normal flashing. Record the tape through in one direction only.

2. To play a stereo recorded or prerecorded 2-track tape.

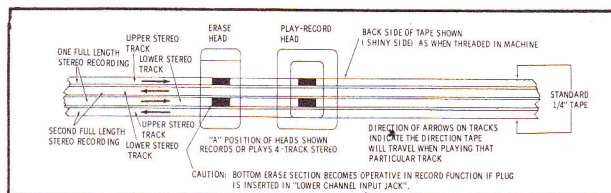


Fig. 7. "A" Position of Heads Shown for Stereo 4-Track Record or Playback

- a. With the Function knob in the Stop position, place the full reel of tape on the left spindle and thread the machine.
 - b. Place the Speed Change knob to the desired tape speed. Make sure that the head track selector knob is turned to the "2-Track" position. The "2-Track" position of the heads is shown in Fig. 6.
 - c. Connect the Lower Channel Auxiliary Amplifier jack at the rear of the recorder to an external amplifier and speaker system. Place the speaker at least 7 feet to the right of the recorder.
 - d. Turn the Function knob to the Play position and play the tape through in one direction only.
 - e. The upper stereo channel or track is played back through the tape recorder and its self-contained speaker (left speaker). The lower stereo channel or track is played back through the external amplifier and speaker system (right speaker).
 - f. In a Hi - Fi hook-up, it may be desired to play back the upper stereo channel through an auxiliary amplifier and speaker system to more closely match the playback of the lower stereo channel. To do this, connect an auxiliary amplifier and speaker system to the Upper Channel Auxiliary Amplifier jack at the rear of the recorder. Set the recorder's Tone control to "Hi - Fi" position and adjust the recorder's Volume control until the "Normal" half of the Upper Channel Record Level indicator flashes. Thereafter, adjust the Volume and Tone controls on the auxiliary amplifier for the desired listening pleasure. To silence the speaker in the recorder, insert a plug into the Upper Channel Extension Speaker jack. For best stereo reproduction, the right and left speakers should be identical units, of good quality, and at least 7 feet apart.
- b. Turn the head track selector knob to the "A" position. This action moves the heads in a position with respect to the tape as shown in Fig. 7.
 - c. Follow the instructions as described in Steps 1-c, 1-d, 1-e, 1-f, 1-g, and 1-h under "To Record or Play Stereo 2-Track Tapes."
 - d. At the end of the first full-length recording, return the Function knob to the Stop position. Take the full reel of tape from the right spindle, turn it over, and place it on the left spindle. Place empty take-up reel on right spindle and rethread the machine.
 - e. Leave the head track selector knob in position "A". Follow instructions 1-c, 1-d, 1-e, 1-f, 1-g, and 1-h, as outlined under "To Record or Play Stereo 2-Track Tapes", and record the second full-length recording.
2. To play a stereo recorded or prerecorded 4-track tape.
 - a. With the Function knob in the Stop position, place the full reel of tape on the left spindle and thread the machine.
 - b. Place the Speed Change knob to the desired tape speed. Make sure that the head track selector knob is turned to the "A" position. The "A" position of the heads is shown in Fig. 7.
 - c. Follow instructions 2-c, 2-d, 2-e, and 2-f as described under "To Record or Play Stereo 2-Track Tapes."
 - d. At the end of the reel, return the Function knob to the Stop position. Take the full reel of tape from the right spindle, turn it over, and place it on the left spindle. Place empty take-up reel on right spindle and rethread the machine.
 - e. Leave the head track selector knob in position "A". Turn the Function knob to the Play position and play the second full length recording through the recorder. Refer to Steps 2-e and 2-f under "To Record or Play Stereo 2-Track Tapes."

To Record or Play Stereo 4-Track Tapes (Series T-2200 Recorders Only)

Stereo 4-track tapes contain two full length recordings (an upper and lower track for each recording) on the dull side of the tape. The procedure for recording and playing 4-track stereo is essentially the same as for recording and playing 2-track stereo. To record or play 4-track stereo, proceed as follows:

1. To record from a radio, television, auxiliary amplifier, or phonograph.
 - a. Turn the Function knob to the Stop position and thread the machine.

Erasing Tape

Whenever a monaural or stereo recording is made, any prerecorded material on the tape is automatically erased before the new material is recorded. Erasure is accomplished only when the recorder is in the Record function. In Series T-2000 recorders the erase head erases approximately 1/2 of the tape each time the tape passes the head.

In Series T-2200 recorders, the upper-channel section only of the erase head erases approximately

1/4 of the tape each time the tape passes the head when making monaural recordings. When making stereo recordings in Series T-2200 recorders, both the upper-channel section and the lower-channel section each of the erase head erases approximately 1/4 of the tape each time the tape passes the head. The lower-channel section of the erase head is made operative only when a plug is inserted into the Lower Channel Input jack for the Record function.

NOTE: When making monaural recordings on Series T-2200 recorders, make sure that no plug is inserted into the Lower Channel Input jack. Inadvertent insertion of a plug into this jack will automatically erase any prerecorded material on the lower channel.

To erase the tape without recording new sound, turn the Volume control down and engage the Record function.

Public Address System

The recorder may be used as a public address system when the Stop function is engaged. Set the slide switch at the rear of the recorder to the P.A./Monitor position and feed the signal from an external source such as a microphone, radio, AM-FM tuner, phonograph, etc., into the jack labeled "Input" in Series T-2000 recorders, or into the jack labeled "Upper Channel Input" in Series T-2200 recorders. The Tone Control is fully effective in the P.A. function. When using the microphone for P.A., keep the distance between the microphone and speaker as far as possible to prevent feedback and howling. For best results plug an external auditorium speaker into the Extension Speaker jack at the rear of the recorder.

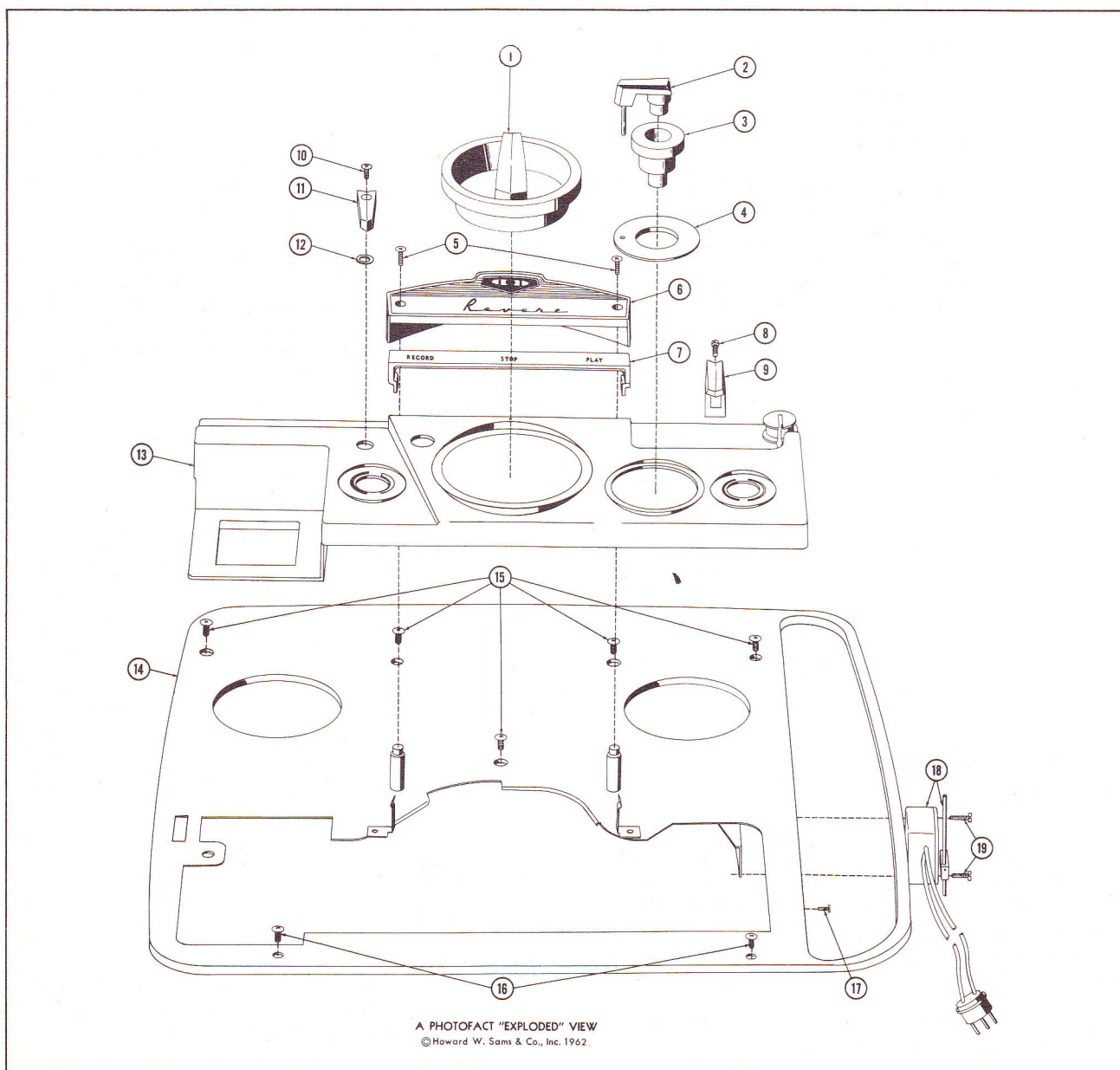


Fig. 8. Exploded View of Plastic Top and Top Plate Assembly

DISSASSEMBLY INSTRUCTIONS

A. To Service Amplifier Tubes Only

1. Turn recorder on its side and remove 6 screws from grilled cover plate on bottom of recorder.
2. Remove cover plate.

B. To Expose Top of Transport Mechanism

Remove plastic top (13) and top plate (14) assembly as follows (refer to Exploded View, Fig. 8).

NOTE: The plastic top and top plate assembly is removed as one piece.

1. Remove screw (10) from Speed Change knob (11). Remove knob and spacer washer (12).
2. Remove screw (8) from High Speed knob (9) and remove knob.
3. Pull up to remove Function knob (1) on-off switch/Volume control knob (2), Tone control knob (3), and Volume control nameplate (4).
4. Remove 2 screws (16) from top of top plate.
5. Remove 5 screws (15) from top of top plate.
6. Remove 1 screw (17) from right-hand side of top plate (inside of storage compartment).
7. On series T-2000 recorders depress the Instant Stop button and, starting at the rear of the recorder, pry up and remove the plastic top and top plate assembly.

NOTE: On series T-2200 recorders, it is advised to first perform the following steps as a precaution to prevent possible damage to the head track selector dial (88), or other associated parts, before attempting to remove the plastic top and top plate assembly.

- a. Remove 2 screws (5) from head cover (6). Remove head cover.
- b. Remove head track selector dial.

- c. Remove plastic top and top plate assembly as stated above for series T-2000 recorders.

The automatic tape cutoff switch is mounted to the top plate and is electrically connected to the amplifier chassis through interconnecting leads terminated in a 3-pin plug. The lead length is sufficient to allow complete withdrawal of the top plate assembly, thus exposing the top of the transport mechanism.

C. To Remove Transport Mechanism and Amplifier Unit From Case

1. Perform preceding steps A and B.
2. Remove 3 remaining screws from bottom of recorder.
3. Carefully lift the unit out of the case.
4. After the unit has been removed from the case, disconnect tape cutoff switch plug from its socket (Fig. 11) and speaker plug from its socket (Fig. 11) on the amplifier chassis. Length of speaker leads permits the speaker to remain in the case.

D. To Remove Amplifier Chassis From Transport Mechanism (Refer to Fig. 11)

Servicing the internal circuitry of the amplifier requires its removal from the transport mechanism. Before any electrical checks can be made, a short must be placed across terminals 2 and 4 of tape cut-off switch socket. Follow the disassembly steps A, B and C and continue in the following manner:

1. Remove screw (201) from amplifier switch arm. Remove switch arm.
2. Disconnect motor and head plugs from amp chassis.
3. Remove 2 Keps nuts from bottom of recorder and 3 Sems truss head screws from right-hand side of recorder. Remove amplifier assembly.

PRELIMINARY TESTS-REPAIR PROCEDURE

TEST PROCEDURE: FAILURE TO PASS ANY OF THESE TESTS INDICATES A FAULT THAT SHOULD BE REMEDIED.

1. Pull up to remove head cover (6) and clean-out cover (7). See Fig. 8. Clean head (119) or heads (104 and 105), tape guides, and capstan with alcohol (See Fig. 13).

2. Turn Function knob (Fig. 1) to Stop position, place High Speed knob (Fig. 1) in the center or neutral position, and turn on recorder.

3. Thread tape on recorder. Brakes (123 and 126, Fig. 9) should be engaged. Pull required on reel should not distort the tape and should offer sufficient

drag to prevent spilling of tape. Drop tape into threading slot. Attach free end to take-up reel. Reel should rotate freely counterclockwise and should drag when rotated clockwise.

4. Turn Function knob to Play position. Brakes on both spindles should release. Record pressure pad assembly (113, Fig. 14) and erase pressure pad assembly (114, Fig. 14) should press tape squarely against head (s). Pressure roller (34, Fig. 9) should contact capstan and tape should move past the head (s) at the speed selected by the Speed Change knob (Fig. 1). Take-up reel should wind up tape as it passes the capstan (182, Fig. 9). The counter (Fig. 1) should tally each revolution of the supply reel.

REVERSE MODELS T-2000, T-2200,
TS-2005, TS-2025, TS-2205, TS-2225

FOLDER 15

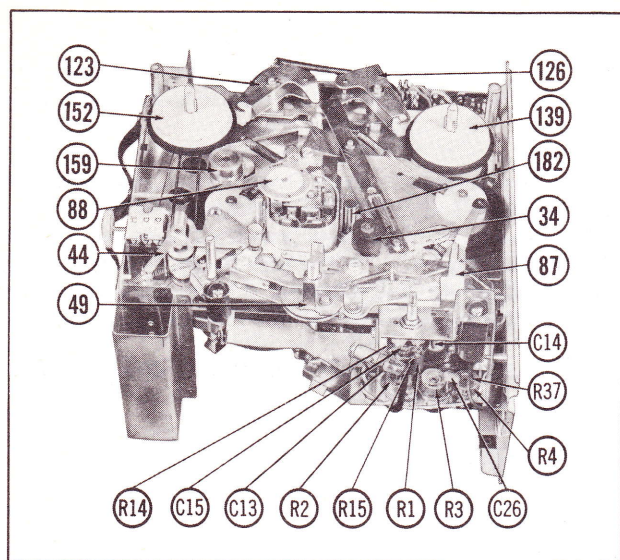


Fig. 9. Top View of Recorder Removed From Case - Plastic Top and Top Plate Assembly (14) Removed.

5. With Function knob in Play position, move High Speed knob to the right for Fast Forward and to the left for Rewind; check to see that Function knob is automatically returned to the Stop position. Pressure roller and pressure pads should also be released. Tape should move in either direction at greatly increased speed.

6. Return High Speed knob to the center or neutral position. Pressure pads and pressure roller should remain disengaged. Brake pressure on spindles should increase smoothly, bringing tape to a stop without spilling.

7. Make a monaural recording as outlined under "To Make And Play Back A Monaural Two (or Twin) - Track Recording" in the "Operating Instructions."

Turn Speed Change knob to make recordings at both speeds.

8. Move High Speed knob to the left and rewind tape. The Function knob should automatically return to Stop position, thus re-setting the Record Lock button.

9. Play back the monaural recording as outlined under to "To Make and Play Back A Monaural Two (or Twin) - Track Recording" in the "Operating Instructions." Play back the recording at both pre-recorded speeds. Check volume, tone, and overall quality.

10. Push in Instant Stop button while recorder is engaged in either Play or Record. Tape should stop instantly. Upon releasing button, tape should start instantly and not spill off the reels.

11. Rewind tape and monaurally re-record over previous recording. All trace of previous recording should be erased on the portion of the tape re-recorded. Check irregularities in playing speed (wow and flutter).

12. In Series T-2200 recorders, make a stereo recording as outlined under "To Record or Play Stereo 2 - Track Tapes."

13. Move High Speed knob to the left and rewind tape. The Function knob should automatically return to Stop position, thus re-setting the Record Lock button.

14. Play back the stereo recording as outlined under to "To Record or Play Stereo 2 - Track Tapes." Check volume, tone, and overall quality.

15. Rewind tape and make another stereo recording over the previous stereo recording. All trace of the previous recording should be erased on the portion of the tape re-recorded.

MECHANICAL ADJUSTMENTS

Amplifier Function Switch Adjustment

Actuating arm (83, Fig. 15) moves the amplifier function switch (M4, page 14) for functions of Record, Stop, or Play. The proper adjustment of the switch actuating arm (83) should be made with the recorder engaged in the Record function. Proceed as follows:

1. Remove recorder from case as specified in "Disassembly Instructions."

2. Engage the Record function of the recorder.

3. Loosen set screw (85, Fig. 15) and turn actuating arm (83, Fig. 15) on function shaft (52, Fig. 15) so that roll pin (84) is positioned in the amplifier function switch slide as shown in Fig. 10. Tighten set screw (85) on actuating arm.

4. To check the adjustment, plug a microphone into the Input jack (Series T-2000 recorders) or Upper Channel Input jack (Series T-2200 recorders). Slide the speaker switch (M6) at the rear of the recorder to the P.A. / Monitor position. Turn the recorder on and increase Volume control until feedback occurs. This

feedback signifies that the correct position of the switch is obtained.

5. Proper adjustment of the function switch for the Record function will automatically allow the proper switching of the amplifier circuits when the Stop and Play functions are engaged.

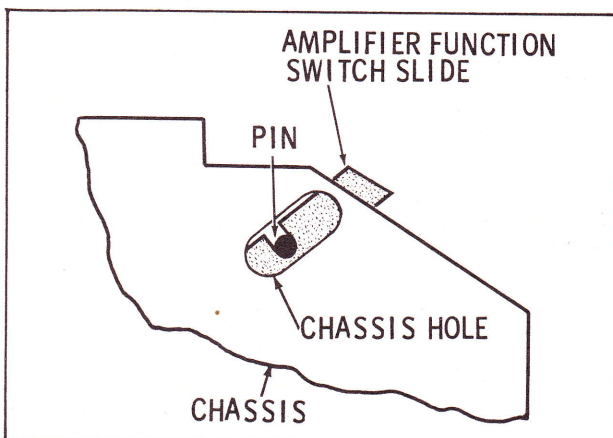


Fig. 10. Amplifier Function Switch (M7) Adjustment

MECHANICAL TROUBLES (REFER TO FIGS. 12 AND 13)

No Tape Drive in Play or Record

Check for the following possibilities:

1. Brake (123) drag on the rewind spindle (152). Spindle should rotate freely. Check for binding of mechanical components.
2. Pressure roller tension spring (48) broken or disconnected. Replace or connect spring.
3. Idler tension spring (68 or 175) disconnected or broken, thereby not holding the 7 1/2 ips speed idler assembly (70) or 3 3/4 ips speed idler assembly (172) against motor pulley (159) and flywheel (182). Connect or replace springs (68 or 175).
4. Motor pulley (159) loose on its shaft. Tighten motor pulley set screws (160).
5. Check for oil or grease on motor pulley (159), 7 1/2 ips speed idler assembly (70), 3 3/4 ips speed idler assembly (172), flywheel (182), and take-up belt (147). If necessary, clean with alcohol.

Take-Up Reel Does Not Turn in Play or Record Although Tape Feeds Past the Capstan

Take-up belt (147) broken or off pulley (146), or flywheel (182). Replace belt, or place back on pulley or flywheel.

Take-Up Reel Stalls in Play or Record When Reel Becomes Nearly Full

1. Grease or oil on take-up belt (147) or on take-up clutch felt (143). Clean with alcohol. Replace felt if necessary.
2. Take-up spindle may be too tight on shaft. Spindle cap may be pressed down too far on shaft so that it keeps the take-up spindle from moving.

Insufficient Tape Takeup in Play and Record

1. Clutch felt (143) may be worn. Replace clutch felt.
2. If necessary, increase takeup by adding another washer (149).

Fails to Record or Play

1. Pressure pad spring (112) weak or broken resulting in pressure pad not holding tape firmly against the record / play element (s). Replace spring (112).
2. Pressure pad worn or missing. Replace.
3. Check for dirt on record / play element (s). Clean with alcohol if dirty.

Fails to Erase

1. Pressure pad spring (115) weak or broken resulting in pressure pad not holding tape firmly against erase element (s). Replace spring (115).
2. Pressure pad worn or missing. Replace.
3. Check for dirt on erase element (s). Clean with alcohol if dirty.

Pressure Pads Do Not Disengage in Stop Position

Check pressure roller arm (54) linkage under sound-head shield cup to see that pressure pad kickout arm (80) is actuated. Check for binding of mechanical components.

Speed Irregularities (Wow and Flutter) During Record or Play

In general, anything which causes a drag or slipping action other than that occurring during normal operation, can cause wow and flutter.

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TS-2005, TS-2025, TS-2205, TS-2225

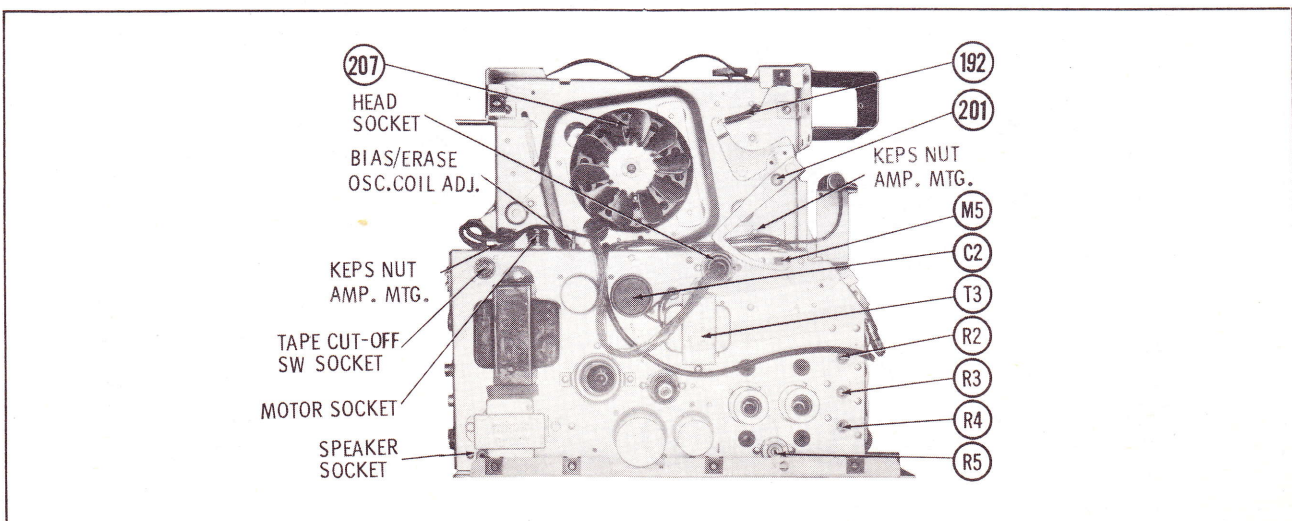
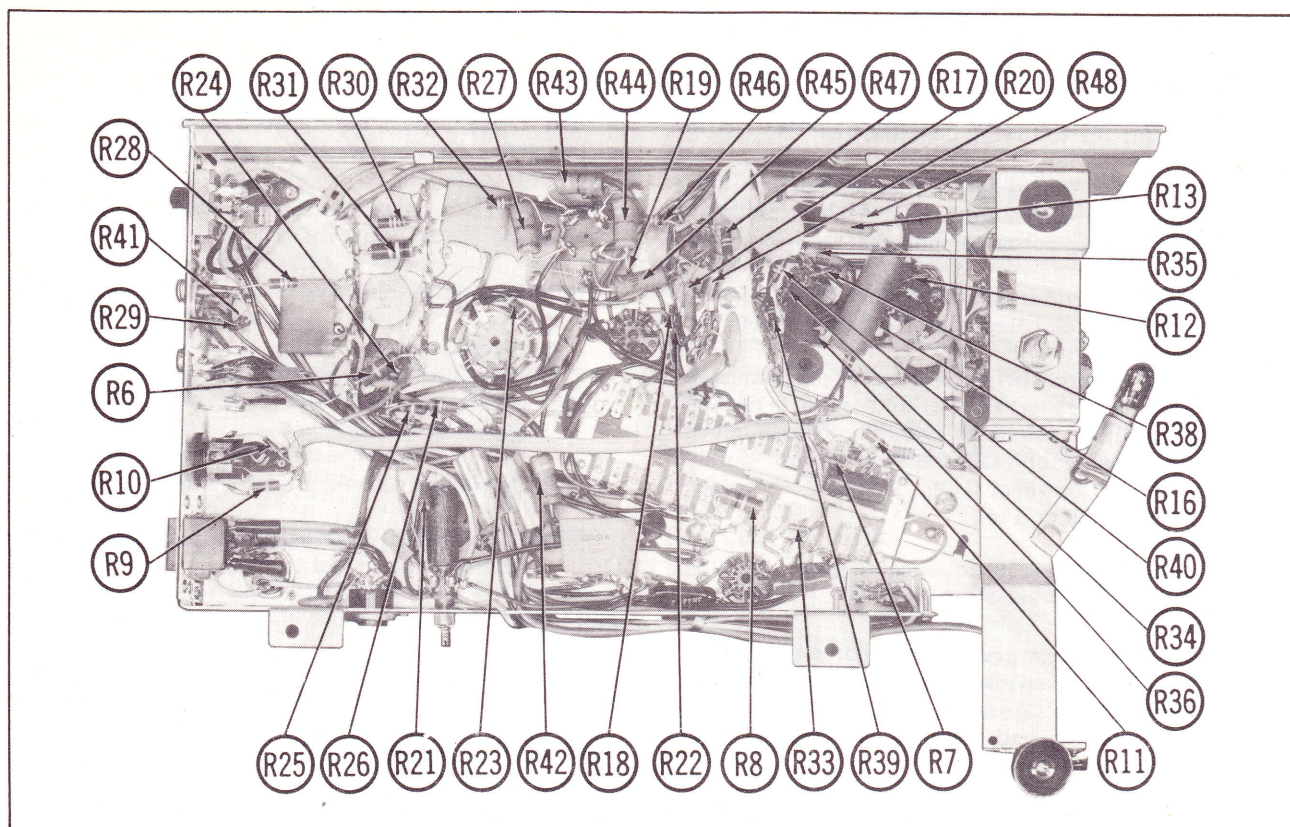
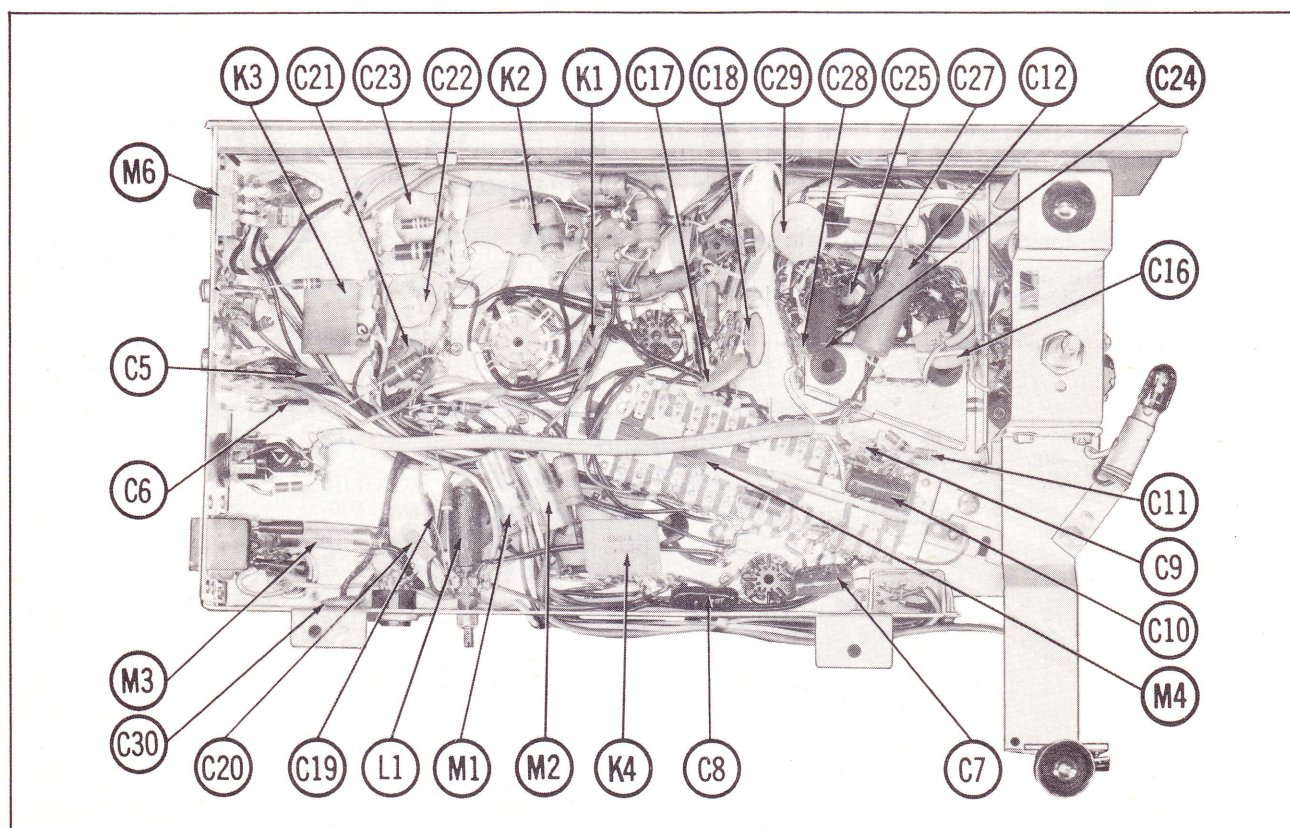


Fig. 11. Bottom View of Recorder Removed From Case

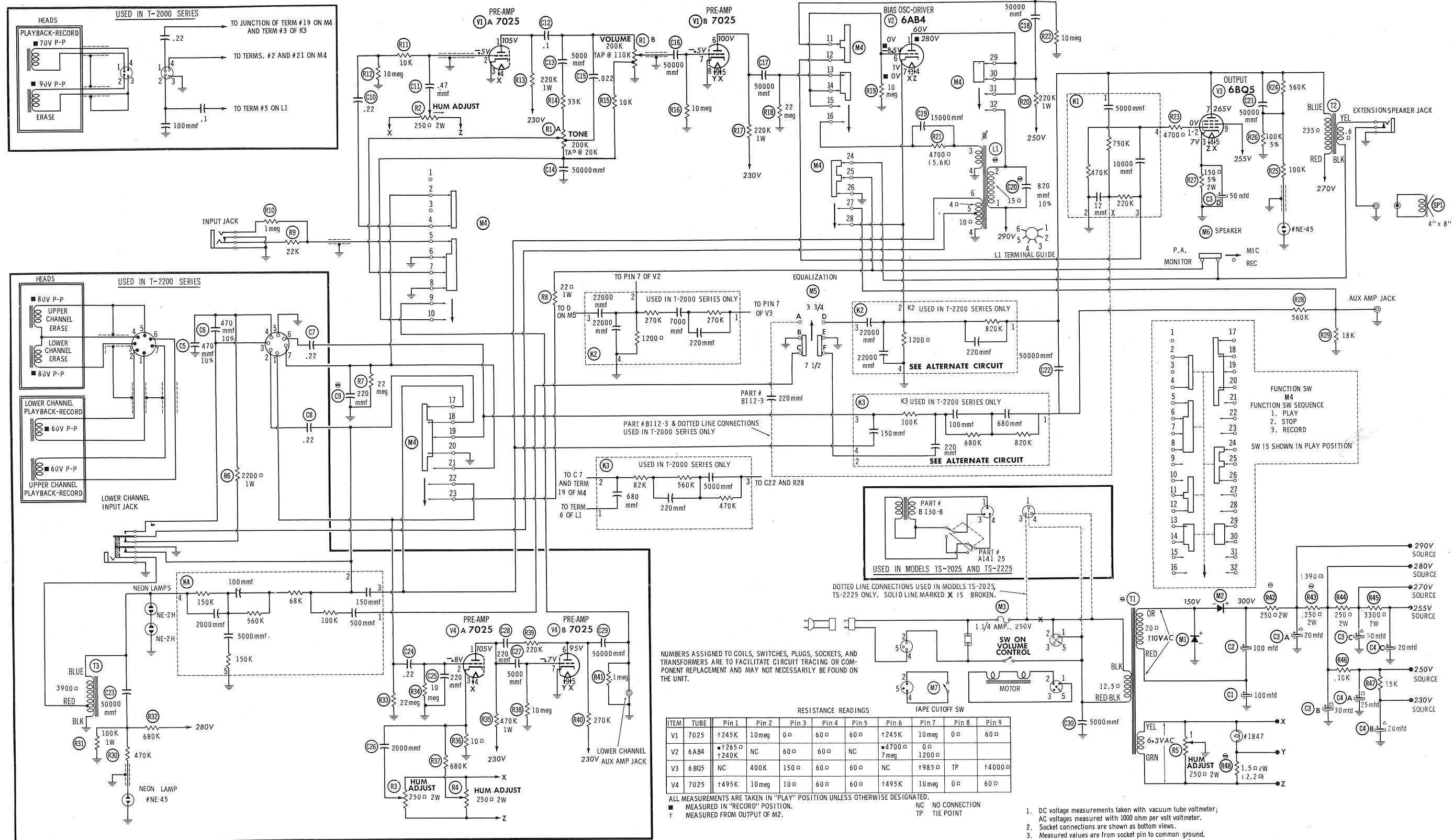
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Bottom View of Amplifier Chassis—Resistor Identification



Bottom View of Amplifier Chassis—Capacitor and Other Component Identification



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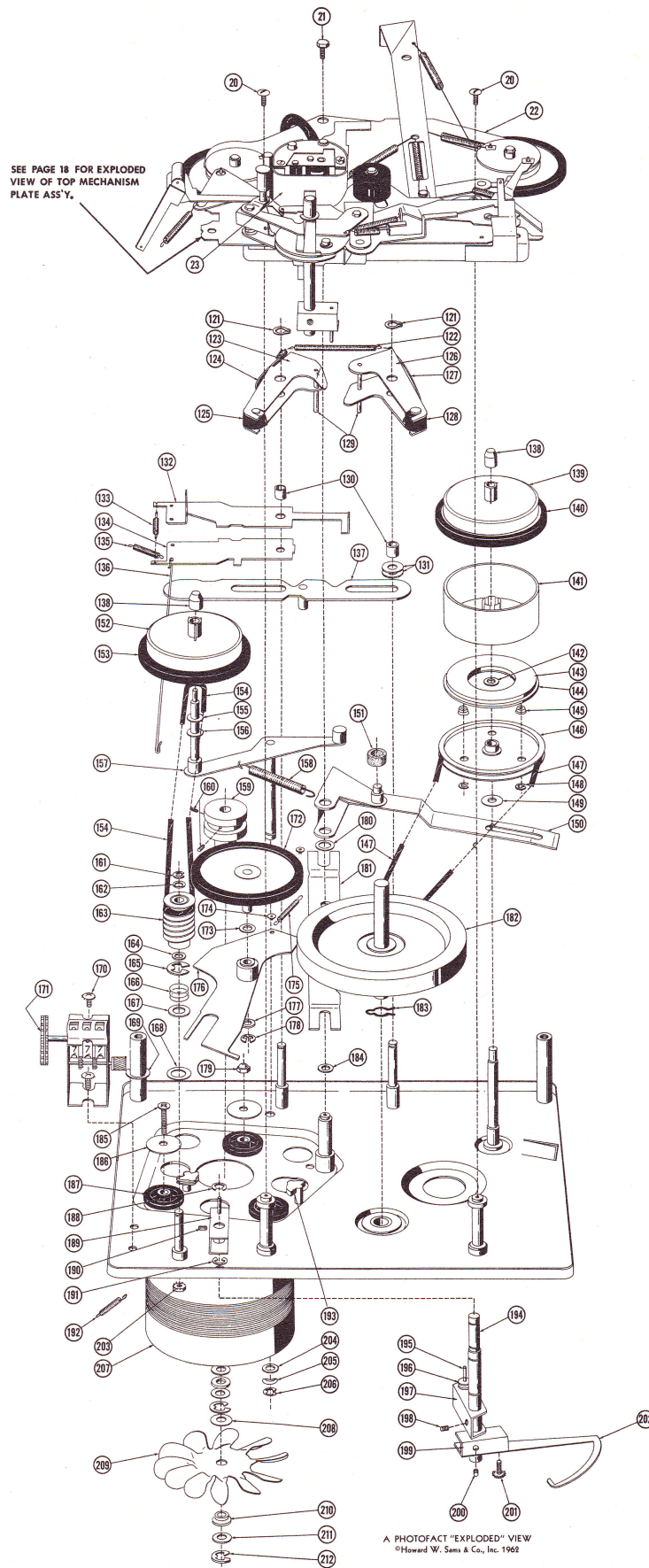


Fig. 12 Exploded View of Transport Mechanism

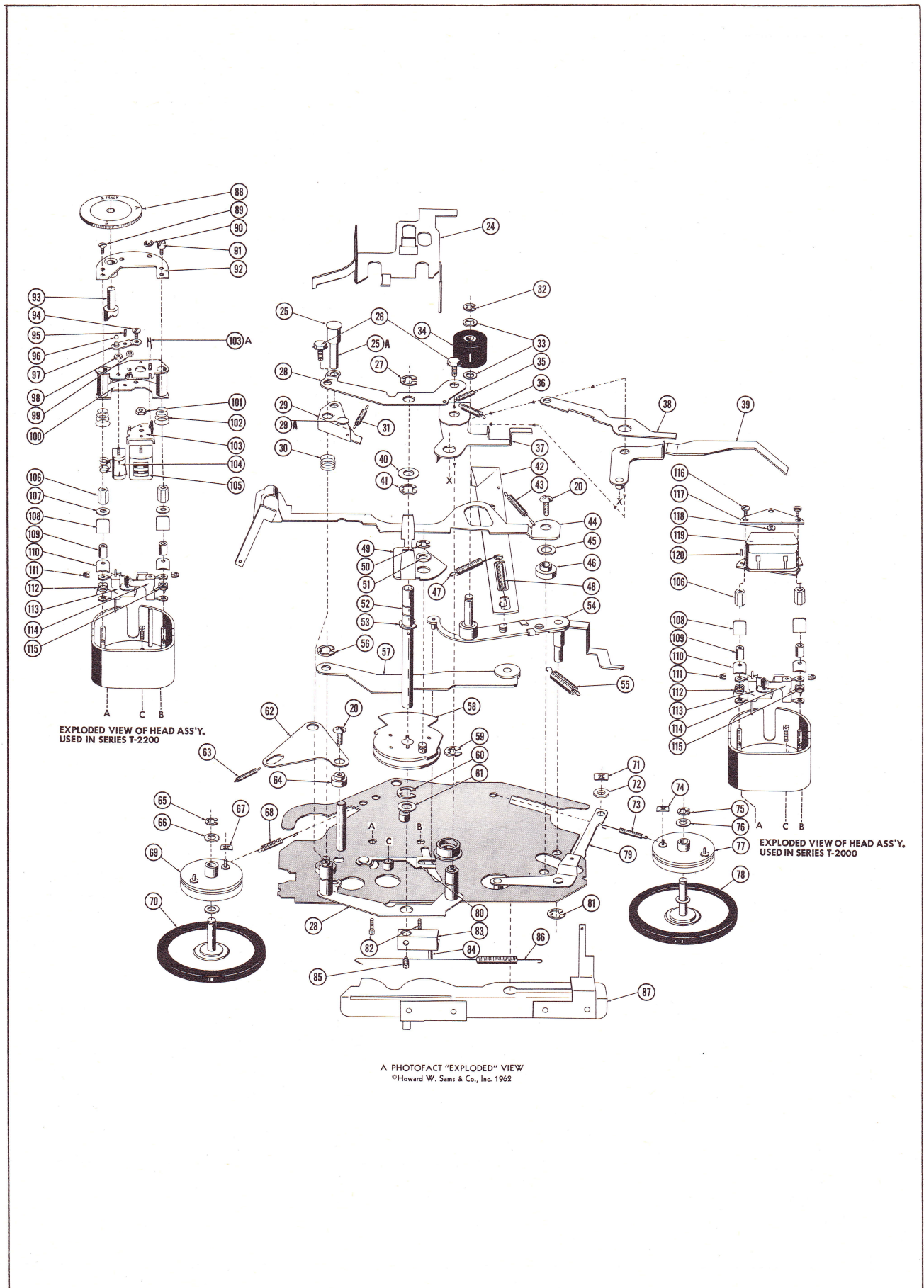


Fig. 13 Exploded View of Top Mechanism Plate Assembly

Check for binding in the following:

1. Flywheel (182) bearings. Check by moving 7 1/2 ips speed idler assembly (70) or 3 3/4 ips speed idler assembly (172) — depending on which speed is selected — and rapid forward idler assembly (78) away from the flywheel; rotate the capstan by hand. A slight drag is normally obtained from take-up belt (147).
2. Right and left reel spindles. The brakes should be disengaged or held away before the spindles are turned.
3. Pressure roller (34) bearing.
4. All idler and drive wheel bearings.
5. Motor bearing. Check by turning shaft by hand.

Check to see that:

1. Supply reel is free to rotate and is not scraping against the top plate.
2. Brakes are completely released.
3. Pressure roller (34) is making good contact with capstan.
4. Capstan and pressure roller are clean.

Check for irregularities in the following:

1. Idler wheel surfaces.
2. Pressure roller (34) surface.
3. Take-up tension. The take-up clutch is designed to slip during normal operation to compensate for the difference in the rate of rotation between a full and empty reel. Check by holding the take-up spindle while the recorder is in the Play function. The clutch action should be smooth and nonpulsating. If the surface of the take-up clutch (143) is gummy or worn, it should be replaced.

Tape Squeal or Squeak

Tape squeal or squeak is heard as a high pitched sound that accompanies recording or playback. It can be heard in quiet surroundings when listening close to the sound head and with the Volume turned down. Squeal or squeak can be minimized as follows:

1. Clean head (s), pressure pads, and tape guides with alcohol.
2. Use a good and known name-brand tape. An inferior brand of tape with insufficient lubrication may be helped by treating it with silicone lubricant.
3. Replace pressure pads. Place thin teflon film tape over pads if necessary.
4. Slightly decrease the tension of pressure pad springs (112 and 115).

Rewinds, But No Rapid Forward (Check Rapid Forward With Nearly Full Take-Up Reel)

1. Check high speed slide arm (87) to see if it moves approximately 7/8" to the right from the neutral position. This should allow idler assembly (78) to be pulled by its spring (73) into contact with high speed drum (141) and flywheel (182). A weak spring (73), binding idler slide (77), or bent arm (79) may prevent this. Also check for binding of other mechanical linkages.
2. With tape speed selector in 7 1/2 ips position, idler slide (69) must be free to slide 7 1/2 ips speed idler assembly (70) into contact with motor pulley (159). Check tension on idler spring (68).
3. With tape speed selector in 3 3/4 ips position, 3 3/4 ips speed idler assembly (172) should make contact with motor pulley (159). Check tension on idler spring (175).
4. Check for oil on drive surfaces. If necessary, clean with alcohol.
5. Pressure pads (113 and 114) and pressure roller (34) should be disengaged.
6. Check rewind spindle to see that it rotates freely. Brakes should be disengaged and rubber tire (153) on rewind spindle (152) should not contact motor pulley (159).

Rapid Forward, But No Rewind

1. Check high speed slide arm (87) to see if it moves approximately 7/8" to the left from the neutral position. Rubber tire (153) on rewind spindle (152) should contact motor pulley (159).
2. Check take-up spindle for free rotation. Brakes should be disengaged, and idler assembly (78) should not be driving high speed drum (141).
3. Rewind arm spring (158) disconnected or broken. Connect or replace spring.

Tape Overruns or Spills When Changing Functions

1. Brake arm spring (122) broken or disconnected. Connect or replace spring.
2. Brake roller springs (124 and 127) broken or disconnected. Replace or connect spring.
3. Clutch felt (143) may be worn. Replace.
4. Check for grease or oil on all driving surfaces.

Function Knob Does Not Return to Stop When High Speed Lever is Moved, or When Volume Control is Turned Off

1. Check for binding in all linkages connected to the mechanism function shaft (52). In part-

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TS-2005, TS-2025, TS-2205, TS-2225

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icular check for binding in the amplifier function switch (M4). To check this, loosen set screw (85) on switch actuating arm (83) and slide upward on function shaft (52). Thereafter, see if mechanism operates normally. Binding in the amplifier function switch may be caused by the switch shield rubbing against the switch slide. In some cases excessive friction in the function switch can be reduced by lubricating the switch contacts with a non-oxidizing lubricant.

2. If turning the Volume control to Off does not trip the Function knob to Stop position, check to see that the roll pin at the bottom of the Volume control knob is tripping function cam pawl (37).

Function Knob Will Not Stay in Play or Record Position

Spring (36) disconnected or broken. This spring must be connected as shown in Fig. 16. If not, the

Function knob will return to Stop position when placed in the Play or Record position.

Faulty Instant Stop

With Function knob in the Play position, actuate the instant stop arm (44). Check to see that upper instant stop plate (132) comes in contact with the rubber tire (153) on rewind spindle (152) the instant the pressure roller (34) starts moving away from the capstan. Tape movement should stop. Upon releasing the instant stop arm, tape should resume its normal travel. If not, check to see that spring (135) is connected as shown in Fig. 17 so that it returns the upper (132) and lower (134) instant stop plate to their original positions, thus disengaging the upper instant stop plate (132) from the spindle tire (153).

Tape Counter Sticks

Counter sticking is usually caused by a defective counter (171) and not by slippage of tape-counter drive belt (154). Check counter.

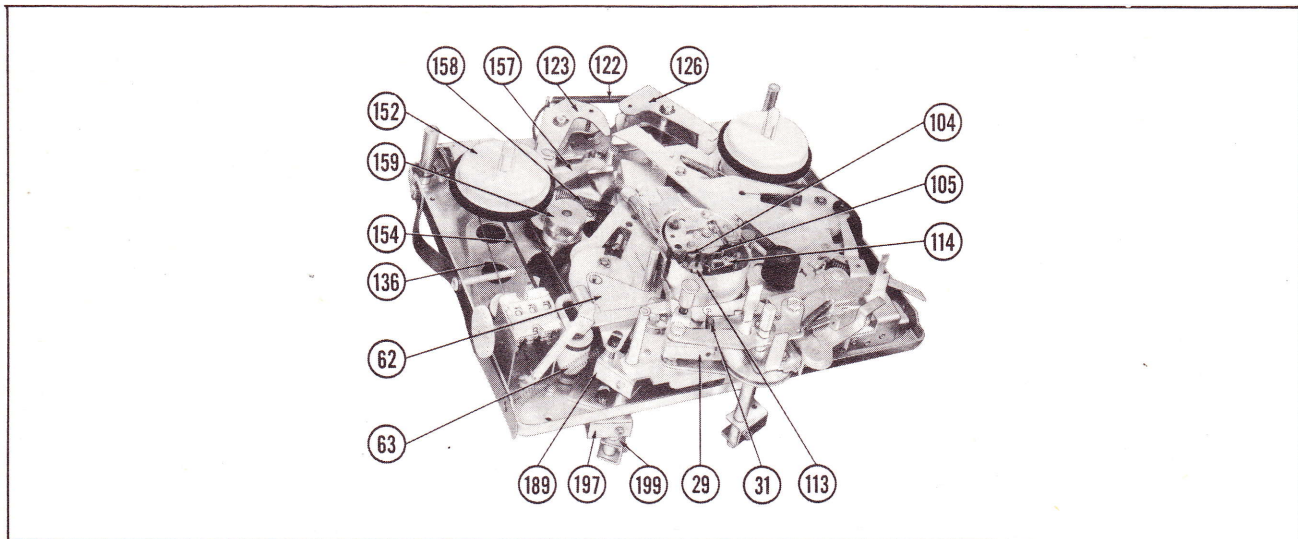


Fig. 14. Exposed View of Transport Mechanism With Amplifier Chassis Removed

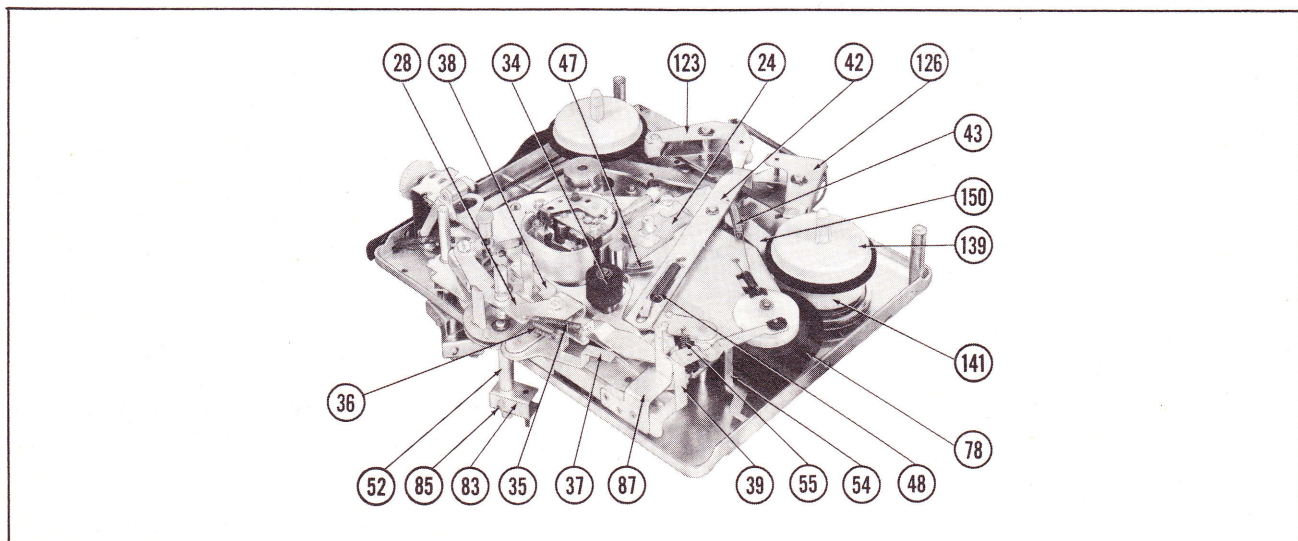


Fig. 15. Exposed View of Transport Mechanism With Amplifier Chassis Removed

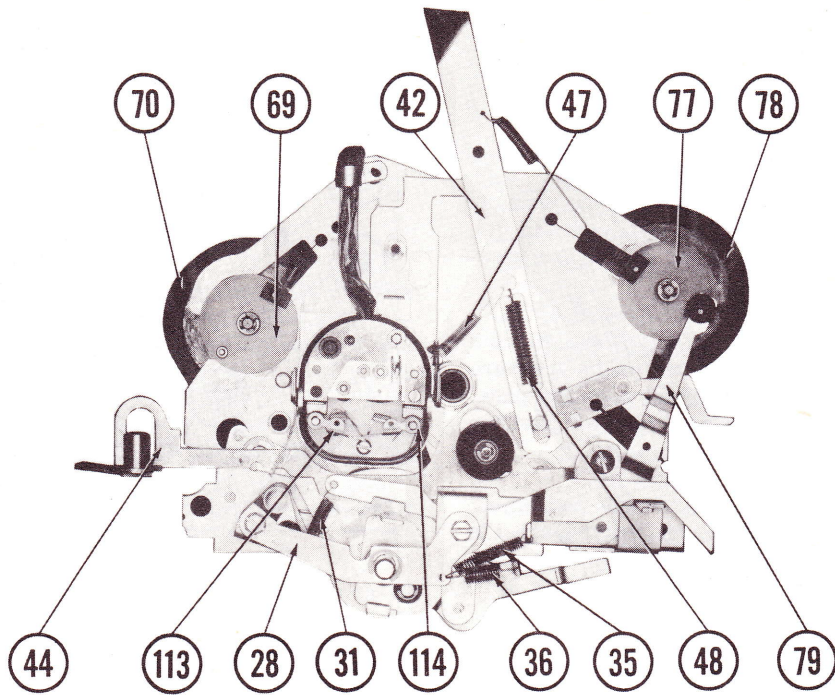


Fig. 16. Top View of Top Mechanism Plate Assembly

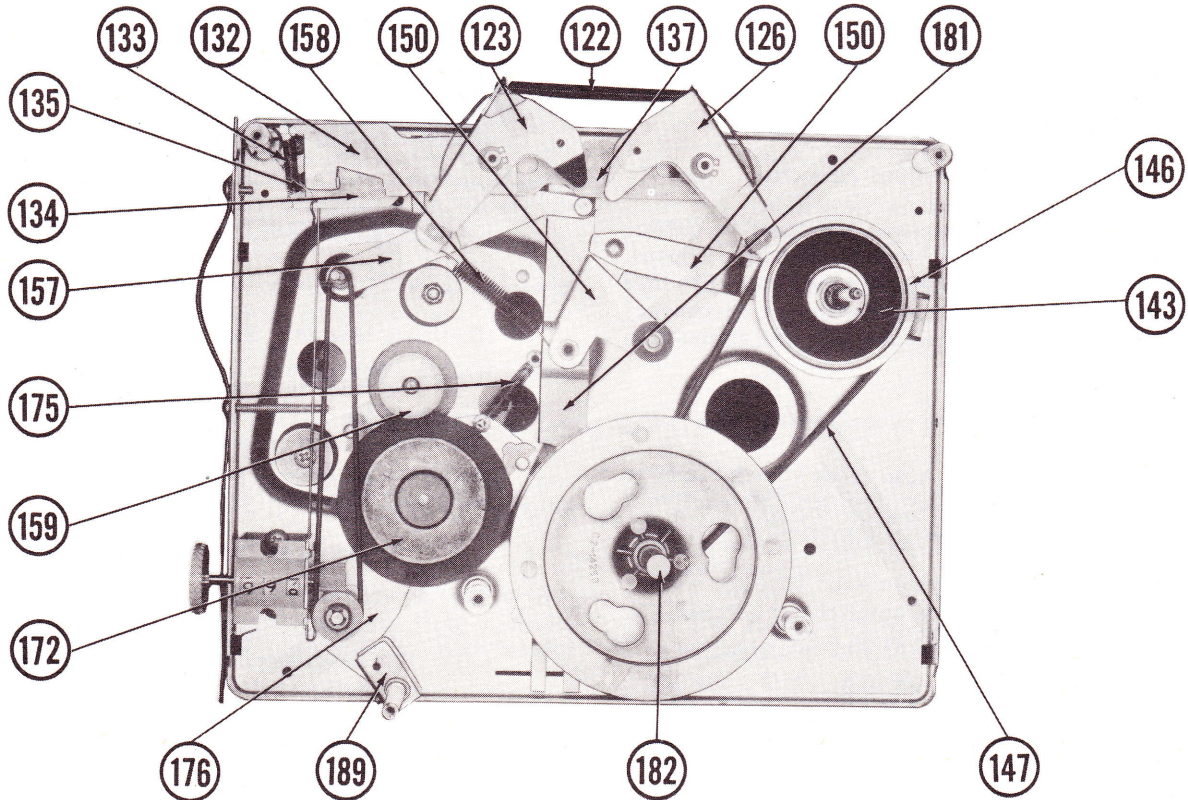


Fig. 17. Top View of Transport Mechanism With Top Mechanism Plate and Spindle Assemblies Removed

ELECTRICAL ADJUSTMENTS

Head Adjustments (Series T-2200 Recorders)

A. To Adjust Record Head Height:

1. Thread the recorder with tape.
2. Turn the head track selector knob to "A" position (furthest position up). Remove head cover (6) and track selector knob (88).
3. Turn Function knob to Play. Place a finger on roll pin in record pressure pad (113), and pull back pressure pads. Tape should move smoothly past the heads.
4. Use a #2 Bristol wrench and adjust the record head height through the head height adjusting hole (See Fig. 18). Adjustment screw is 3/4" below hole.
5. Adjust record head height until top of upper element is exactly even with the tape as shown in Fig. 19.

B. To Adjust Erase Head Height:

1. Repeat Steps A-1, A-2, and A-3 as stated above.
2. Turn erase head mounting nut (98, Fig. 18) so that the top of the upper erase element is even with the upper edge of the tape (Fig. 19). Use "Lock-tite" cement to secure nut (98).

C. To Adjust Record Head Azimuth

An alignment tape, which can be obtained from Ampex or the larger radio supply houses, should be used to best align the head. The tape should have a full-track recording at a frequency higher than 6,000 cps. Adjust head azimuth as follows:

1. Thread the recorder with tape.
2. Turn the head track selector knob to the "2 Track" position. Remove head cover (6) and track selector knob (88).
3. Turn Function knob to Play. Adjust record head azimuth nut (99, See Fig. 18) for maximum output.
4. In lieu of the alignment tape, play a commercial prerecorded 2-track tape and adjust the head for maximum treble tone.
5. After adjusting the azimuth, check to see that the head height has not been disturbed. Use "Locktite" cement on the adjustment nuts.

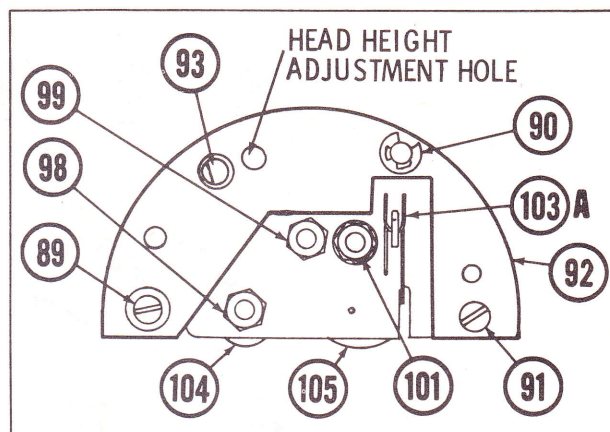


Fig. 18. 4-Track Head Assembly

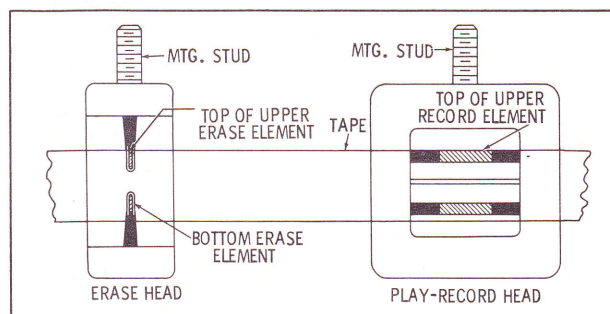


Fig. 19. Head Height Location

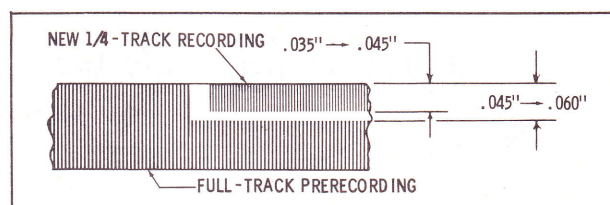


Fig. 20. Magnetic Dispersal Pattern

D. Using Magnetic Particles to Locate Tracks:

If there is doubt about the head adjustments, it can best be checked with magnetic powder dispersal, such as the Magna-See Kit manufactured by Reeves Soundcraft, Danbury, Connecticut. The procedure is as follows:

1. Set head track selector knob to "A" position.
2. Make a constant tone recording (any frequency) on a previously recorded full or half-track tape.
3. Submerge a small section of the tape as described in the Magna-See Kit instructions. The pattern should appear as shown in Fig. 20. Inexpensive pocket microscopes calibrated in thousandths of an inch can be used to measure the track width.

Head Azimuth Adjustment (Series T-2000 Recorders)

An alignment tape, which can be obtained from Ampex or the larger radio supply houses, should be used to best align the head. The tape should have a full-track recording at a frequency higher than 6,000 cps. Adjust head azimuth as follows:

1. Thread the recorder with tape and remove head cover (6).
2. Turn Function knob to Play and adjust azimuth screw (120, Fig. 13) for maximum output.
3. In lieu of the alignment tape, play a previously recorded tape and adjust the head for maximum treble note. After the final adjustment is made, cement the azimuth screw (120) with "Loctite."

Hum Balancing Adjustment (Refer to Fig. 11)

Four access holes are provided in the grilled tube-cover plate on bottom of recorder for adjustment of the hum controls. Turn recorder on its right side (as viewed from front). A series of 3 holes, above and slightly to the left of the words "Remove To Replace Tubes", are provided in the cover plate. The hole to the extreme right provides for the adjustment of R2, the hole in the middle for adjustment of R3, and the hole to the extreme left for adjustment of R4. The remaining hole provides for the adjustment of R5 (See Fig. 11). Adjust controls with a small-bladed screwdriver, the shaft on which is at least 3-inches long.

Hum controls R2 and R5 are used in both Series T-2000 and T-2200 recorders. Hum controls R3 and R4 are used in Series T-2200 recorders only. R2 and R5 adjustments affect the hum level for monaural playback and record operations, and also the hum level for the stereo record and playback operations of the upper channel in Series T-2200 recorders only.

Adjust hum controls R2 and R5 as follows:

1. Turn recorder on, allow warmup, and then turn Function knob to the Play position.
2. Set Volume control at "1" position (minimum). To lower hum, first try reversing the power plug.
3. If hum still exists, adjust R5 for minimum hum.
4. Turn Volume control to "11" position (maximum) and adjust R2 for minimum hum. If R2 adjusts for minimum hum at one end of its rotation, leave Volume control at maximum and readjust R5 for minimum hum.

The stereo preamp hum balancing controls R3 and R4 are used in Series T-2200 recorders only and affect the hum level for stereo playback operations from the lower channel of the stereo head. The stereo preamp adjustments have been factory adjusted for minimum hum, but in some cases, a readjustment may be necessary.

Adjust R3 and R4 as follows:

1. First, perform hum balancing adjustments for R2 and R5 as specified above.
2. Turn up the Volume control on the auxiliary amplifier that is connected to the recorder's Lower Channel Auxiliary Amplifier jack in a typical stereo hookup.
3. Adjust R3 and R4 for minimum hum.

Bias Current Adjustment

Make the bias current adjustments as follows:

A. Series T-2200 Recorders

1. Remove grilled tube-cover plate on bottom of recorder as per "Disassembly Instructions."
2. Disconnect head plug (Fig. 11).
3. Select a length of single conductor insulated hook-up wire. Strip the insulation from each end of the wire.
4. Wrap one end of the bare hook-up wire around pin # 4 of head plug and reinsert plug into head socket (Fig. 21).
5. Upon reinsertion of the head plug into its socket, check to see that the bare end of the hook-up wire connected to pin # 4 does not touch the chassis or any of the other plug pins.
6. Connect a VTVM (capable of accurately measuring voltage at 75kc) between the other bare end of the hook-up wire (pin # 4) and chassis ground.
7. Engage the Record function of the recorder.
8. Adjust bias / erase oscillator coil (L1) core until VTVM reads 28 VAC. See Fig. 11 for adjustment screw.

B. Series T-2000 Recorders.

1. Repeat Step A-1 as per above.
2. Disconnect head plug (Fig. 11).
3. Repeat Step A-3 as per above.
4. Wrap one end of the bare hook-up wire around pin # 2 of head plug and reinsert plug into head socket.
5. Upon reinsertion of the head plug into its socket, check to see that the bare end of the hook-up wire connected to pin # 2 does not touch the chassis or any of the other plug pins.

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6. Connect a VTVM (capable of accurately measuring voltage at 60kc) between the other bare end of the hook-up wire (pin # 2) and chassis ground.

7. Repeat Step A-7 as per above.

8. Adjust bias / erase oscillator coil (L1) core until VTVM reads 45 VAC. See Fig. 11 for adjustment screw.

ELECTRICAL TROUBLES ASSOCIATED WITH BOTH SERIES T-2000 AND T-2200 RECORDERS (REFER TO PAGES 15 AND 16)

The following electrical troubles are associated with both the monaural operations of Series T-2000 recorders and the stereo / monaural operations of the upper channel only used in Series T-2200 recorders.

The electrical troubles associated with the lower-channel stereo operations in Series T-2200 recorders are covered separately under the heading "Electrical Troubles Associated With the Lower Channel Operations Used in Series T-2200 Recorders." See page 26.

Weak Playback Volume or No High Frequencies

1. Check for B+ voltage as per schematic. Check M1, M2, R42, R43, R44, and R45. Replace defective components.
2. Check tubes V1, V2, and V3. Replace if defective.
3. Check for dirty sound head. Clean head with alcohol.
4. Check pressure pads for wear or improper contact.
5. Wrong type of tape or wind. Dull side of tape should be wound "in" or "A" wind.

6. Check record head azimuth as outlined under "Electrical Adjustments."

7. Head may be worn badly or need replacement. Replace head as outlined under "Replacing Sound Heads."

Recorder Dead, Pilot Lamp Off

1. Blown fuse (M3). If recorder blows fuses repeatedly, check for B+ shorts in power supply circuits.
2. Check power transformer (T1) for open or short.
3. Check power cord and On-Off switch on Volume control (R1B).

No Playback or Record, Pilot Light On

1. Check all tubes and associated voltages as per schematic. The trouble can be localized by monitoring the output at the Auxiliary Amplifier (or Upper Channel) jack in the Play position. If no signal is present, trouble exists in some preceding stage. Connect an audio generator to the grid of each tube of each stage to isolate the area of fault.
2. Check for defective head.

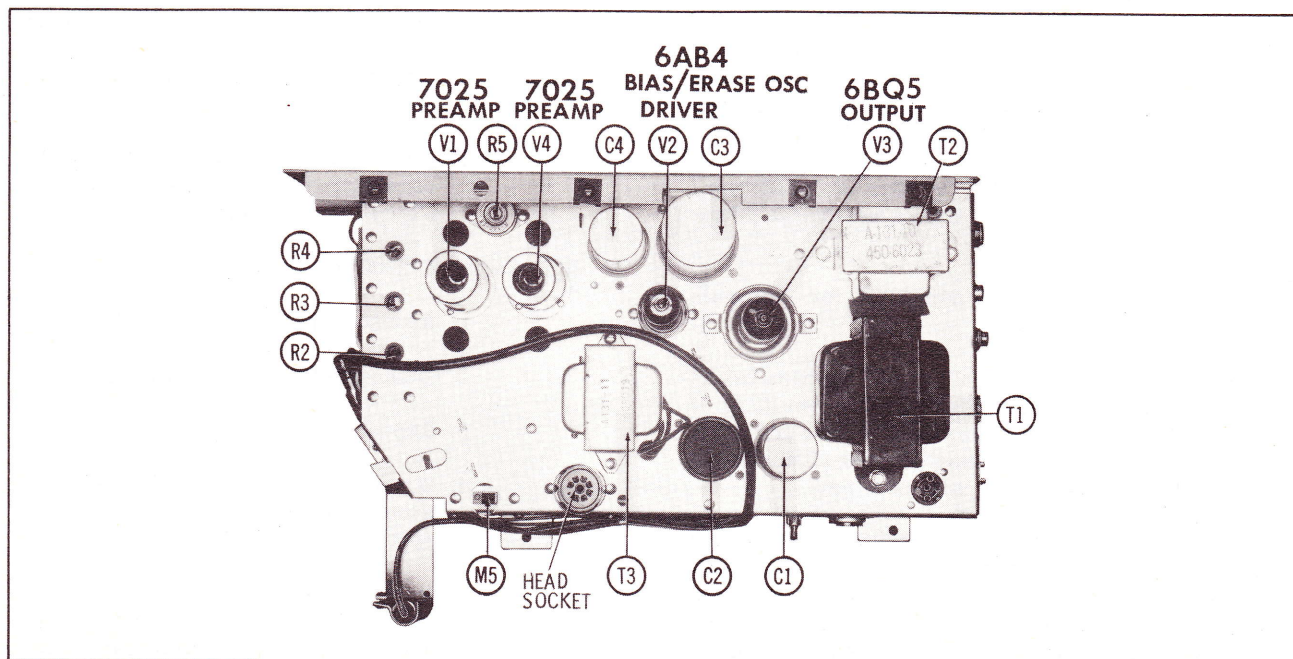


Fig. 21. Top View of Amplifier Chassis

Plays Back, But Does Not Record

1. Check "Amplifier Function Switch Adjustment" as outlined under "Mechanical Adjustments."
2. Check recording source; microphone may be dead, or other source may be faulty.
3. Check V2 and associated voltages. Check bias/erase oscillator coil (L1) and associated components.
4. Check record network (K3).
5. Check Input (or Upper Channel) jack and associated components in the grid input circuit to V1.
6. Check C7 and C22. Replace if defective.

Records, But Does Not Play Back

1. Check "Amplifier Function Switch Adjustment" as outlined under "Mechanical Adjustments."
2. Monitor a recording by setting the speaker switch (M6) at the rear of the recorder to the Monitor/ P. A. position. If recording can be heard, output circuits are functioning. If recording cannot be heard, check V3, T2, Extension (or Upper Channel) Speaker jack and speaker. Check plug and socket that connect speaker.
3. Check associated components in the grid input circuit to V1.

Weak or Distorted Record, Playback of Prerecorded Tape Normal

1. Check Input (or Upper Channel) jack for proper contact. Check to see that ground spring breaks contact when input plug is inserted into Input jack.
2. Check microphone or other recording source for quality of signal. Failure to push plug firmly all the way into jack will cause distortion. Any accessory microphone must have a short plug to make contact to Input jack "ring" spring.
3. Check Record Level (or Upper Channel) indicator lamp. A defective lamp may result in a recording level which is too high or low.
4. Check V2 and associated voltages. Check bias/erase oscillator coil (L1) and associated components.
5. Check record network (K3), C7, and C22. Replace defective components.
6. Make "Bias Current Adjustment" as outlined under "Electrical Adjustments."

Record Level (or Upper Channel) Indicator Inoperative or Operation Faulty. Records and Plays Back Properly

1. Check for defective lamp.
2. Check R24, R25, R26 and C21. Replace defective components.
3. Excessive hum or oscillation of amplifier may cause the lamp to glow continuously. Check to see if metal shield is in place over Input or (Upper Channel) jack.

Hum in Record or Playback

1. Check tubes V1, V2, and V3 for heater-to-cathode leakage. Replace defective tubes.
2. Check hum controls R2 and R5. Refer to "Hum Balancing Adjustments" as described under "Electrical Adjustments."
3. Check B+ filter capacitors C3 and C4.
4. Keep recorder away from hum fields such as fluorescent lamps, amplifiers, transformers, etc.
5. Make a recording from another microphone or external source to see if hum is inherited from the recording source.

Weak or No Erase, Records Over Previous Recordings

1. Check for dirt on erase element. Clean with alcohol. Check pressure pads.
2. Check V2 and associated voltages. Check bias/erase oscillator coil (L1) and associated components.
3. Check "Bias Current Adjustment" as outlined under "Electrical Adjustments." (Page 23)
4. Check erase element for open or short.

Excessive Erase, Tape Burns When Instant Stop is Used in Record Function

Refer to "Bias Current Adjustment" under "Electrical Adjustments." (Page 23)

Microphonic Noises

Microphonic noises usually develop in the first stages of an amplifier where the sensitivity is greatest, but can develop in other stages. Check V1. If V1 is not microphonic, check remaining tubes V2 and V3.

Excessive Tape Hiss

1. Check for sufficient recording level by comparing to a prerecorded tape.
2. Try a fresh, high-quality tape. Tape may be worn.

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3. Check V2 and associated voltages in Record. Check bias/erase oscillator coil (L1) and associated components.
4. Check "Bias Current Adjustment" as outlined under "Electrical Adjustments." A poor erase or bias waveform can cause a low signal-to-noise ratio in the recorded signal.

5. Check automatic demagnetization circuit which operates by shorting C7 across the play-record coil at the termination of the Record function. The .22 mfd capacitor resonates the Record head to provide a decaying demagnetization transient.

6. Head may be microphonic. Replace head.

ELECTRICAL TROUBLES ASSOCIATED WITH LOWER CHANNEL OPERATIONS USED IN SERIES T-2200 RECORDERS (REFER TO PAGES 15 AND 16)

Plays Back, But Does Not Record (Upper Channel Operations Normal)

1. Check Lower Channel Input jack. Insertion of plug should switch contacts for proper operation.
2. Check recording source.
3. Check T3, K4, and C8. Replace defective components.
4. Check bias/erase oscillator coil (L1).

Records, But Does Not Play Back (Upper Channel Operations Normal)

1. Check V4. Replace if defective.
2. Check associated voltages of V4 as per schematic. Replace any defective components.
3. Check tubes in auxiliary amplifier which is connected to recorder's Lower Channel Auxiliary Amplifier jack in a typical stereo hook-up.

Weak or Distorted Record, Playback of Prerecorded Tape Normal (Upper Channel Operations Normal)

1. Check Lower Channel Input jack for proper contact. Failure to push plug firmly all the way into jack will cause distortion.
2. Check Lower Channel Record Level indicator lamp.
3. Check record network (K4), T3, and C8. Replace defective components.
4. Check bias/erase oscillator coil (L1) and associated components.

5. If necessary, make "Bias Current Adjustment" as outlined under "Electrical Adjustments."

Lower Channel Record Level Indicator Inoperative or Operation Faulty. Records and Plays Back Properly.

1. Check for defective lamp.
2. Check R30, R31, R32, and C23. Replace defective components.

Hum in Record or Playback (Upper Channel Operations Normal)

1. Check V4 for heater-to-cathode leakage.
2. Check hum controls R3 and R4. Refer to "Hum Balancing Adjustments" as described under "Electrical Adjustments."
3. Make a recording from another source to see if hum is inherited from the recording source.

Weak or No Erase, Records Over Previous Recordings (Upper Channel Operations Normal)

1. Check for dirt on erase element. Clean with alcohol. Check pressure pads.
2. Check erase element for open or short.
3. Check "Bias Current Adjustments" as outlined under "Electrical Adjustments." (Page 23)

Microphonic Noises

Check V4. Check tubes in the auxiliary amplifier which is connected to the recorder's Lower Channel Auxiliary Amplifier jack in a typical stereo hook-up.

CLEANING

The majority of defects, other than wear or breakage, can be traced to dirty surfaces. The heads (104, 105, or 119), capstan, and pressure roller (34) are subject to an accumulation of tape residue, which is worn off the tape as it passes these parts. This

accumulation should be periodically removed since it will cause faint recordings and poor playback. Wipe off the above surfaces carefully with a clean cloth. If dirt is caked or hard and will not come off with a dry cloth, dampen cloth slightly with alcohol.

LUBRICATION

All moving parts of the recorder were permanently lubricated at time of manufacture. Under normal

use further lubrication should not be required. In heavy-duty service, the following parts should be lub-

ricated once a year with a drop or two of # 10 motor oil:

1. The top and bottom motor bearings.
2. The top and bottom flywheel (182) bearings.
3. Pressure roller (34) bearings.

4. All idler and drive wheel bearings.

5. The reel spindle bearings.

The basic rule is -- do not over-lubricate. Oil must be kept off rubber idlers, belts, and periphery of flywheel, and off parts that might transfer oil to them. Always wipe excess lubricant from parts that have been lubricated.

REPLACING SOUND HEADS

Make sure that all other possible sources of trouble associated with the Play and Record functions of the recorder have been eliminated before replacing the heads. Check the following:

1. Heads may be dirty. Clean with alcohol.
2. Pressure pads may be worn and need replacement, or the pads may not be pressing the tape squarely against the heads.
3. Trouble in amplifier.
4. Loose connections in head cables.

Replacement of Heads in Series T-2200 Recorders

There are two heads used in Series T-2200 recorders: an in-line stereo head and a separate erase head. The in-line stereo head may be used to:

1. Record and playback monaural 2- or 4- track tapes.
2. Record and playback stereo 2- or 4- track tapes.

The erase head erases the tape of any signal prior to recording new material.

A. To Remove Heads From Recorder (Refer to Figs. 13 and 18).

1. Expose top of transport mechanism as outlined in the "Disassembly Instructions."
2. Remove following: screw (89), "E" ring (90), and stud screw (91).
3. Lift off cam shank and pin assembly (93) with bushing and cover plate assembly (92). Be careful not to lose the small steel ball (96) located on the cam adjustment lever (97).
4. Lift upper and lower bushing plate assembly (100) in which the heads are mounted. The head-connecting cable should be aided up at the same time to prevent damage to the connecting wires. Any side motion of the slide assembly will cause it to bind. If head cable is too tight, loosen cable-retaining clamp on top mechanism plate (22) and slide some slack through the clamp.

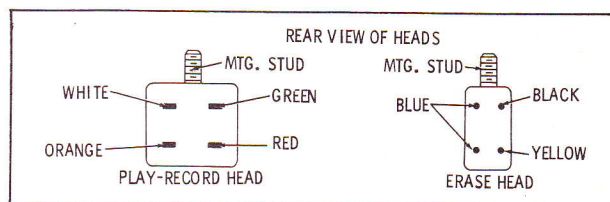


Fig. 22. Color Coding of Head Connections

B. Replacing Record Head (105) Only.

If only the record head is defective, it can be replaced without further disassembly. Remove record head as follows:

1. Pry up cable-retaining clamp behind record head.
2. Disconnect wires from the head-connecting pins by grasping each connector with a pair of long-nose pliers and pulling back. Note wire color coding as shown in Fig. 24.
3. Unscrew azimuth adjustment nut (99). Remove spring clip (103A) and remove head (105) and head mounting plate (103).
4. Remove record head mounting nut (101) and pry head from mounting plate (103). To install the replacement head, reverse the disassembly procedure.

C. Replacing Erase Head (104) Only.

Remove erase head as follows:

1. Pry up cable-retaining clamp behind record head.
2. Disconnect wires from head-connecting pins. The wire connections are crimped into the erase head pins, and therefore need to be cut in order to be removed. Note wire color coding as shown in Fig. 24. After wires are cut, strip the insulation from the ends of the wires in readiness for connecting to the replacement head.
3. Remove erase head mounting nut (98), see Fig. 18. Remove head and slide-bracket assembly. To install the replacement head reverse the disassembly procedure.

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After the defective record and/or erase heads have been replaced, completely reassemble the head assembly into the head shield cup. Make sure that the head cable is routed away from all moving parts. Press down firmly on the cam shank and pin assembly (93) to see that the upper and lower bushing plate assembly (100) is free to move up and down. If the head cable or cable clamp presses against the head cup, the assembly will not move freely. Align head height and azimuth as outlined under "Electrical Adjustments."

Replacement of Head in Series T-2000 Recorders

The head used in Series T-2000 recorders is a combination play-record-erase head. Its use provides for the record and playback of monaural 2 (or twin) - track tapes. Replace head as follows (refer to Exploded View, Fig. 13):

A. To Remove Head From Recorder.

1. Expose top of transport mechanism as outlined in the "Disassembly Instructions."
2. Remove screws (116) and head hold-down spring (117).

3. Lift head and brass alignment plate from head shield cup. If head cable is too tight, loosen cable-retaining clamp on top mechanism plate (22) and slide some slack through the clamp.

B. Replacing Head

1. Pry head from brass alignment plate. Note position of location pins.
2. Install the replacement head over the location pins in the alignment plate and press into place.
3. Replace alignment plate into head cup. The two brass pivot studs should engage the two holes in the plate.
4. Replace head hold-down spring.

After the head has been completely reassembled, make sure that the head cable is routed away from all moving parts. Align head azimuth as described under "Electrical Adjustments."

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description	Used in Models
1	C15-17560	Function Knob	All
2	A1-17574	Volume Control Knob Ass'y.	All
3	A1-17625	Tone Control Knob & Nameplate Ass'y.	All
4	A12-17542	Nameplate, Volume	All
5	A14-17583	Screw, Head Cover	All
6	A1-17623	Head Cover & Nameplate Ass'y.	All
7	C15-17561	Clean-Out Cover	All
8	A14-14735	Screw, # 4-40 Fillister Hd.	All
9	B15-17559	High Speed Knob	All
10	A9-17587	Speed Control Knob Mtg. Screw, # 6-32 x 7/32"	All
11	A2-17535	Speed Control Knob	All
12	A8-12076	Spacer Washer	All
13	C1-17569	Plastic Top & Nameplate Ass'y.	T-2200, TS-2225, TS-2205
	C1-17627	Plastic Top & Nameplate Ass'y.	T-2000, TS-2025, TS-2005
14	R1-17570	Plastic Top & Top Plate Ass'y. (Includes Ref. No. 13)	T-2200, TS-2225, TS-2205
	R1-17628	Plastic Top & Top Plate Ass'y. (Includes Ref. No. 13)	T-2000, TS-2025, TS-2005
	R1-17567	Top Plate Riveted Ass'y.	All
15	A9-17587	Top Plate Screw, # 6-32 x 7/32"	All
16	A14-17606	Flat Head Screw, # 4-40 x 3/8"	All
17	A14-11304	Self-Tapping Screw, # 4 x 1/4"	All
18	A1-17629	Cut-Off Switch Ass'y.	All
19	A14-14722	Screw, # 4-40 x 5/8", Cut-Off Switch Mtg.	All

Ref. No.	Part No.	Description	Used in Models
20	A14-14556	Screw, # 8-32 x 1/2" Truss Head	All
21	A14-14731	Screw, # 8-32 x 1/4" Slotted Hex. Hd. Sems	All
22	C1-17621	Top Mechanism Plate Ass'y.	All
23	B1-17276	Head Shield Riveted Ass'y.	T-2000, TS-2025, TS-2005
	B1-17280	Head Shield Riveted Ass'y.	T-2200, TS-2225, TS-2205
24	C3-14744	Tape Guard Plate	All
25	A4-11060	Record Lock Release Button	All
25A	A9-11110	Roll Pin, Record Lock	All
26	A14-14731	Screw, # 8-32 x 1/4" Slotted Hex. Hd. Sems	All
27	A9-17705	"E" Ring, 5/16" Shaft	All
28	A3-11003	Function Shaft Bracket	All
29	A3-11010	Record Lock Pawl	All
29A	A9-17469	Felt Sticker	All
30	A13-17710	Safety Button Spring	All
31	A13-14127	Record Lock Pawl Spring	All
32	A9-13200	"E" Ring, 5/32" Shaft	All
33	A8-14623	Washer, Fibre	All
34	A30-14068	Pressure Roller Ass'y.	All
35	A13-17712	Spring	All
36	A13-11200	Cam Pawl Spring	All
37	B3-11008	Function Cam Pawl	All
38	B3-11009	Lock, Function Cam	All
39	A1-12364	High Speed Trip Lever Ass'y.	All
40	A8-11130	Washer, Fibre	All
41	A9-17705	"E" Ring, 5/16" Shaft	All
42	B3-17607	Spring Arm	All
43	A13-14424	Spring	All
44	A1-17595	Instant Stop Arm Ass'y.	All
45	A8-17735	Washer, Flat Steel	All
46	A4-17601	Instant Stop Arm Pivot	All
47	A13-17764	Spring	All
48	A13-17711	Pressure Roller Tension Spring	All
49	B3-11002	Cam Drive Arm	All

MECHANICAL PARTS LIST (CONT'D.)

Ref. No.	Part No.	Description	Used in Models
50	A9-11888	"E" Ring, 3/16" Shaft	All
51	A8-11130	Washer, Fibre	All
52	A4-11061	Function Shaft	All
53	A9-17705	"E" Ring, 5/16" Shaft	All
54	B1-17568	Pressure Roller Arm & Switch Arm Ass'y.	All
55	A13-11203	Pressure Roller Arm Spring	All
56	A9-12670	"E" Ring, 1/4" Shaft	All
57	A1-12369	Function Arm Ass'y.	All
58	B1-12353	Function Cam Ass'y.	All
59	A9-17705	"E" Ring, 5/16" Shaft	All
60	A9-17705	"E" Ring, 5/16" Shaft	All
61	A8-11130	Washer, Fibre	All
62	A3-12375	Fast Speed Lever	All
63	A13-14127	Fast Speed Lever Spring	All
64	A4-11229	Link Spacer	All
65	A9-11888	"E" Ring, 3/16" Shaft	All
66	A8-10472	Washer	All
67	A9-10960	Tinnerman Speed Nut	All
68	A13-17714	Idler Drive Spring	All
69	A1-14503	7 1/2 Idler Slide Ass'y.	All
70	A1-14771	7 1/2 Idler Ass'y., 60 CPS	T-2200, T-2000
	A1-17124	7 1/2 Idler Ass'y., 50 CPS	TS-2225, TS-2025, TS-2205, TS-2005
71	A9-10960	Tinnerman Speed Nut	All
72	A9-17487	Adhesive Pad	All
73	A13-14421	Rapid Forward Idler Spring	All
74	A9-10960	Tinnerman Speed Nut	All
75	A9-11888	"E" Ring, 3/16" Shaft	All
76	A8-10472	Washer, Nylon	All
77	A1-14503	Rapid Forward Idler Slide Ass'y.	All
78	A1-14771	Rapid Forward Idler Ass'y.	All
79	A1-17719	High Speed Forward Idler Arm Sub-Ass'y.	All
80	A3-17665	Pressure Pad Kickout Arm	All
81	A9-12670	"E" Ring, 1/4" Shaft	All
82	A14-17207	Screw, # 6-32 x 1/8"	All
83	A1-12355	Switch Actuating Arm Ass'y.	All
84	A9-11108	Roll Pin, 1/8" x 1"	All
85	A17-11129	Set Screw, # 10-32 x 1/4"	All
86	A13-12416	Detent Spring	All
87	A1-12363	High Speed Slide Arm Ass'y.	All
88	A1-17397	Selector Dial Ass'y.	T-2200, TS-2225, TS-2205
89	A14-15829	Crosslock Screw	T-2200, TS-2225, TS-2205
90	A9-13200	"E" Ring, 5/32" Shaft	T-2200, TS-2225, TS-2205
91	A14-17356	Stud Screw	T-2200, TS-2225, TS-2205
92	A1-17236	Bushing & Cover Plate Ass'y.	T-2200, TS-2225, TS-2205
93	A1-17234	Cam, Shank & Pin Ass'y.	T-2200, TS-2225, TS-2205
94	A14-17208	Screw, # 3-56 Slotted Pan Hd.	T-2200, TS-2225, TS-2205
95	A17-17209	Screw, # 3-56 Bristol Socket Hd.	T-2200, TS-2225,

Ref. No.	Part No.	Description	Used in Models
96	A9-17223	Steel Ball, 1/16"	TS-2205 T-2200, TS-2225, TS-2205
97	A1-17230	Cam Adj. Lever & Ball Retainer Ass'y.	T-2200, TS-2225, TS-2205
98	A4-17211	# 4-40 Hex Nut, Erase Hd. Mtg.	T-2200, TS-2225, TS-2205
99	A4-17212	# 2-56 Hex Nut, Azimuth Adj.	T-2200, TS-2225, TS-2205
100	A1-17232	Upper & Lower Bushing Plate Ass'y.	T-2200, TS-2225, TS-2205
101	A4-17213	# 4-40 Hex Nut, Record Head Mtg.	T-2200, TS-2225, TS-2205
102	A13-17196	Conical Spring	T-2200, TS-2225, TS-2205
103	A1-17233	Pin, Stud & Record Head Mtg. Plate Ass'y.	T-2200, TS-2225, TS-2205
103A	A13-17465	Spring Clip	T-2200, TS-2225, TS-2205
104	B161-8	Erase Head Ass'y.	T-2200, TS-2225, TS-2205
105	B161-6	Record-Play Head	T-2200, TS-2225, TS-2205
106	A4-14359	Hex Head Spring Spacer	All
107	A8-17225	Washer	T-2200, TS-2225, TS-2205
108	A3-17672	Tape Guide, Top	All
109	A4-17692	Tape Guide, Spacer	All
110	A3-17671	Tape Guide, Bottom	All
111	A9-13199	"E" Ring, 1/8" Shaft	All
112	A13-17715	Record Pad Spring	All
113	A1-17228	Record Pressure Pad Ass'y.	T-2200, TS-2225, TS-2205
	A1-17614	Record Pressure Pad Ass'y.	T-2000, TS-2025, TS-2005
	A9-17227	Record & Erase Pressure Pad Felt	T-2200, TS-2225, TS-2205
	A9-17707	Record & Erase Pressure Pad Felt	T-2000, TS-2025, TS-2005
114	A1-17229	Erase Pressure Pad Ass'y.	T-2200, TS-2205, TS-2225
	A1-17613	Erase Pressure Pad Ass'y.	T-2000, TS-2025, TS-2005
115	A13-17360	Erase Pad Spring	All
116	A14-1057	Screw, # 3-48 x 1/8"	T-2000, TS-2025,

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MECHANICAL PARTS LIST (CONT'D.)

Ref. No.	Part No.	Description	Used in Models
117	A13-14320	Head Hold Down Spring	TS-2005
118	A4-14360	Head Insulator	T-2000, TS-2025, TS-2005
119	C161-1	Play-Record & Erase Head	T-2000, TS-2025, TS-2005
120	A17-17717	Set Screw # 4-48 Bristol, Azimuth Adj.	T-2000, TS-2025, TS-2005
121	A9-12315	Grip Ring	All
122	A13-14111	Brake Arm Spring	All
123	A1-17641	Brake Arm & Pin Ass'y., Left	All
124	A13-14077	Brake Roller Leaf Spring	All
125	A15-14943	Brake Roller	All
126	A1-17642	Brake Arm & Pin Ass'y., Right	All
127	A13-14077	Brake Roller Leaf Spring	All
128	A15-14943	Brake Roller	All
129	A9-11111	Roll Pin, 1/8" x 1 1/16"	All
130	A4-17611	Brake Arm Spacer	All
131	A8-17699	Washer, Brake Arm	All
132	A3-17522	Instant Stop Plate, Upper	All
133	A13-17290	Spring	All
134	A3-17503	Instant Stop Plate, Lower	All
135	A13-17458	Spring	All
136	A13-17599	Instant Stop Wire	All
137	A1-17591	Rear Slide Cam Ass'y.	All
138	A15-17562	Spindle Cap	All
139	A1-17636	Spindle Cup & Tire Ass'y.	All
140	A30-17103	Spindle Tire	All
141	A1-17128	Clutch Sleeve & High Speed Forward Drum Ass'y.	All
142	A8-17697	Washer, Fibre	All
143	A9-17384	Take-Up Clutch Felt	All
144	A1-14513	Clutch Plate & Felt Ass'y.	All
145	A13-17393	Clutch Plate Spring	All
146	A1-14228	Take-Up Pulley Ass'y.	All
147	A30-17718	Take-Up Belt	All
148	A9-13199	"E" Ring, 1/8" Shaft	All
149	A8-17699	Washer, Flat Steel	All
150	A1-17580	Toggle Arm & Take-Up Clutch Lever Ass'y.	All
151	A30-17549	Toggle Arm Bumper	All
152	A1-17619	Rewind Spindle & Tire Ass'y.	All
153	A30-17103	Spindle Tire	All
154	A30-11101	Counter Belt	All
155	A8-14400	Washer, Phenol	All
156	A8-14441	Washer, Fibre	All
157	B1-14107	Rewind Support Arm Ass'y.	All
158	A13-17713	Rewind Arm Spring	All
159	B4-17525	Motor Pulley, 60 CPS	T-2200, T-2000
	A4-17334	Motor Pulley, 50 CPS	TS-2225, TS-2025, TS-2205, TS-2005
160	A17-17609	Set Screw, # 8-32	All
161	A9-11888	"E" Ring, 3/16" Shaft	All

Ref. No.	Part No.	Description	Used in Models
162	A8-17697	Washer, Fibre	All
163	A15-14007	Counter Worm	All
164	A8-17697	Washer, Fibre	All
165	A9-17700	"E" Ring, 3/8" Shaft	All
166	A13-14481	3 3/4 Slide Pressure Spring	All
167	A8-14004	Washer, Phenol	All
168	A8-5824	Washer, Flat Steel	All
169	A9-11104	Push-On Type Speed Nut	All
170	A14-14732	Screw, # 8-32 x 3/8" Sems Truss Hd.	All
171	C9-17530	Counter	All
172	A1-14727	3 3/4 Idler Wheel & Shaft Ass'y.	All
173	A8-17697	Washer, Fibre	All
174	A9-17292	Push Rivet Stud Spring Retainer	All
175	A13-17290	3 3/4 Idler Pulley Spring	All
176	A1-12413	Slow Idler Slide Ass'y.	All
177	A8-17697	Washer, Fibre	All
178	A9-11888	"E" Ring	All
179	A9-17704	Stop Nut, Motor Mtg.	All
180	A8-17698	Washer, Fibre	All
181	B3-17668	Slide Cam Connecting Arm	All
182	A1-14609	Flywheel Ass'y.	All
183	A9-17120	Retaining Clip	All
184	A8-17697	Washer, Fibre	All
185	A14-17605	Screw, Motor Mtg.	All
186	A8-13197	Washer, Flat Steel	All
187	A30-14023	Motor Isolator	All
188	A9-10289	"C" Ring	All
189	A1-12355	7 1/2 Actuating Cam	All
190	A17-11129	Set Screw, # 10-32 x 1/4"	All
191	A9-10289	"C" Ring	All
192	A13-17458	Detent Arm Spring	All
193	A15-12392	Slide Guide	All
194	A4-12385	Speed Control Shaft	All
195	A9-11108	Roll Pin	All
196	A15-12406	Detent Roller	All
197	A1-12355	3 3/4 Actuating Cam	All
198	A17-11129	Set Screw, # 10-32 x 1/4"	All
199	A3-12415	Switch Actuating Arm	All
200	A17-11129	Set Screw, # 10-32 x 1/4"	All
201	A14-14732	Screw, # 8-32 x 3/8" Sems Truss Hd.	All
202	A3-12381	Amplifier Switch Arm	All
203	A9-11184	Hex Nut, Keps, # 10-32	All
204	A8-17697	Washer, Fibre	All
205	A8-14793	Spring Washer	All
206	A9-11888	"E" Ring, 3/16" Shaft	All
207	B1-17764	Motor Assembly	T-2200, T-2000
	B1-17765	Motor Assembly	TS-2225, TS-2025, TS-2205, TS-2005
208	A8-17696	Washer, Flat Steel	All
209	B3-17593	Fan	All
210	A30-14471	Fan Grommet	All
211	A8-17696	Washer, Flat Steel	All
212	A9-12670	"E" Ring, 1/4" Shaft	All

ELECT. PARTS LIST AND DESCRIPTIONS

TUBES

GENERAL ELECTRIC			RAYTHEON		SYLVANIA	
ITEM No.	USE	TYPE	ITEM No.	USE	TYPE	
V1	Preamplifier	7025	V3	Output	6BQ5	
V2	Bias Osc. -Driver	6AB4	V4	Preamplifier	7025 Note 1	

Note 1. Not used in T2000 Series.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA					
	CAP.	VOLT.	REVERE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	GENERAL ELECTRIC PART No.	MALLORY PART No.	PYRAMID PART No.
C1	100	200	A119-21					
C2	100	200	A119-20					
C3A	20	350	A119-18A	AFH3-110 PRS1640		XC4-63		
B	30	350						
C	30	350						
D	50	10						
C4A	25	300	A119-17A	AFH2-32 PRS1650				
B	20	300						
C	20	300						

FIXED CAPACITORS

ITEM No.	RATING	REMARKS	REPLACEMENT DATA					
			AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ELMENCO PART No.	MALLORY PART No.	SPRAGUE PART No.
C5	470 10%	Note 1	1469-00047		5R5T47	CM-19B-47IK	MCJ244	MS-347
C6	470 10%	Note 1	1469-00047		5R5T47	CM-19B-47IK	MCJ244	MS-347
C7	.22 100V		P288N-22		CUB2P22	1DP-3-224	GEM-2122	2TM-P22
C8	.22 100V	Note 1	P288N-22		CUB2P22	1DP-3-224	GEM-2022	2TM-P22
C9	.22 100V	Note 2	DI-220	DD-221	LI0722	CCD-221	B-322	10TS-T22
C10	.22 100V		P288N-22		CUB2P22	1DP-3-224	GEM-2022	2TM-P22
C11	.47		NPO-SL .5	TCZ-R5				
C12	.1 400V		P488N-1	DF-104	CUB4P1	4DP-3-104	GEM-401	4TM-P10
C13	.005		BPD-005	DD-502	BYA10D5	CCD-502	B-250	5HK-D50
C14	.05		BPD-05	DD-503	CUB6S5	6DP-1-503	GP150	5HK-S50
C15	.022 100V		P288N-022	DD-203	CUB4S22	1DP-1-223	GEM-4122	2TM-S22
C16	.05		BPD-05	DD-503	CUB6S5	6DP-3-503	GP150	5HK-S50
C17	.05		BPD-05	DD-503	CUB6S5	6DP-3-503	GP150	5HK-S50
C18	.05		BPD-05	DD-503	CUB6S5	6DP-3-503	GP150	5HK-S50
C19	.015		BPD-015	DD-153	BYA10S15	CCD-153	B-115	5HK-S15
C20	820 10%	Note 3	1469-00082		5R5T82	CM-19B-82IK	MCB251	MS-382
C21	.05		BPD-05	DD-503	CUB6S5	6DP-3-503	GP150	5HK-S50
C22	.05		BPD-05	DD-503	CUB6S5	6DP-3-503	GP150	5HK-S50
C23	.05	Note 1	BPD-05	DD-503	CUB6S5	6DP-3-503	GP150	5HK-S50
C24	.22 100V	Note 1	P288N-22		CUB2P22	1DP-3-224	GEM-2022	2TM-P22
C25	.220	Note 1	DI-220	DD-221	LI0722	CCD-221	B-322	10TS-T22
C26	.002	Note 1	BPD-002	DD-202	BYA10D2	CCD-202	B-220	5HK-D20
C27	.005	Note 1	BPD-005	DD-502	BYA10D5	CCD-502	B-250	5HK-D50
C28	.220	Note 1	DI-220	DD-221	LI0722	CCD-221	B-322	10TS-T22
C29	.05	Note 1	BPD-05	DD-503	CUB6S5	6DP-3-503	GP150	5HK-S50
C30	.005		BPD-005	DD-502	BYA10D5	CCD-502	B-250	5HK-D50

Note 1. Not used in T2000 Series.

Note 2. 680mmf used in T2000 Series.

Note 3. 1300mmf used in T2000 Series.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESIST-ANCE	WATTS	REVERE PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	CTS-IRC PART No.	MALLORY PART No.	
RIA	200K	1/2	B140-16					Tone
B	20K Tap	1/2						Volume
C	110K Tap Switch							Power Off-On

CONTROLS (cont)

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESIST-ANCE	WATTS	REVERE PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	CTS-IRC PART No.	MALLORY PART No.	
R2	250Ω	2(WW)	A140-13					Hum Adjust
R3	250Ω	2(WW)	A140-13 ①					Hum Adjust
R4	250Ω	2(WW)	A140-13 ①					Hum Adjust
R5	250Ω	2(WW)	A140-12					Hum Adjust

① Not used in T2000 Series.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING	REPLACEMENT DATA			ITEM No.	RATING	REPLACEMENT DATA		
		IRC PART No.	WORKMAN TV PART No.	REMARKS			IRC PART No.	WORKMAN TV PART No.	REMARKS
R6	2200Ω 1W				R28	560K			
R7	22meg				R29	18K			
R8	22Ω 1W				R30	470K			Note 1
R9	22K				R31	100K 1W			Note 1
R10	1meg				R32	680K			Note 1
R11	10K				R33	22meg			Note 1
R12	10meg				R34	10meg			Note 1
R13	220K 1W				R35	470K 1W			Note 1
R14	33K				R36	10Ω			Note 1
R15	10K				R37	680K			Note 1
R16	10meg				R38	10meg			Note 1
R17	220K 1W				R39	220K			Note 1
R18	22meg				R40	270K			
R19	10meg				R41	1meg			
R20	220K 1W				R42	125Ω 2W			(250Ω)*
R21	4700Ω			(5600Ω)*	R43	250Ω 2W			(390Ω)*
R22	10meg				R44	250Ω 2W			
R23	4700Ω				R45	3300Ω 2W			
R24	560K				R46	10K			
R25	100K				R47	15K			
R26	100K				R48	1.5Ω 2W			(2.2Ω)*
R27	150Ω 2W								

Note 1. Used in Model T-2200 only.

* Value used in Model T-2200.

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	REVERE PART No.	REPLACEMENT DATA
K1	Feedback Network	12mmf, .005mmf, .01mfd, 220K, 470K, 750K	A177-14B	
K2	Playback Network	220mmf, .022mfd, .022mfd, 1200Ω, 820K	A177-15A	Model T2200 Series
	Playback Network	220mmf, .007mfd, .022mfd, .022mfd, 1200Ω, 270K, 270K	A117-19	Model T-2000 Series
K3	Record Network	100mmf, 150mmf, 220mmf, 680mmf, 100K, 680K, 820K	A177-16	Model T-2200 Series
	Record Network	220mmf, 680mmf, .005mfd, 82K, 470K, 560K	A177-20	Model T-2000 Series
K4	Record Network	100mmf, 150mmf, 500mmf, .002mfd, .005mfd, 68K, 100K, 150K, 150K, 560K	A177-17A	Model T-2200 Series only

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		REVERE PART No.	Merit PART No.	Miller PART No.	Stancor PART No.	Workman TV PART No.	
L1	Osc.	A132-12 ①					① Part #A132-13 used in T2000 Series.

ELECT. PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA					NOTES
	PRI.	SEC. 1	SFC. 2	REVERE PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	117V @ .34A	110V @ .2A	6.3V @ 1.4A *	B130-13A ①					① Alternate #B130-13 * 1.7A for T-2200 Series.

WIRING DATA

General-use Unshielded Hook-up Wire Use BELDEN No. 8530 (Solid) Available in Ten Colors
 8524 (Stranded) Available in Ten Colors
 Power Cord Use BELDEN No. 1765-B (6 Ft. Length)
 1725-K (7½ Ft. Length)
 Low-Loss Shielded Lead (Interconnecting) Use BELDEN No. 8401
 Phono Pick-up Arm Cable Use BELDEN No. 8430 (Two Conductor - Twisted)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES
	PRI.	SEC.	REVERE PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	5200Ω	6-8Ω	A131-10	A-2902	A-3823	24S07	S-54X	

AUTOFORMER

ITEM No.	TURNS RATIO		REPLACEMENT DATA					NOTES
	PRI.	SEC.	REVERE PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T3	40	1	A131-11					

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	REVERE PART No.	QUAM PART No.	
SP1	4"x 8"	PM	6-8Ω	C-160-11	48A2Z8	

POWER RECTIFIERS

ITEM No.	RATING	REPLACEMENT DATA			NOTES
	CURRENT (Measured)	REVERE PART No.	RCA PART No.	SARKES TARZIAN PART No.	
M1	.045A	A123-5	1N1763	F4	
M2	.045A	A123-5	1N1763	F4	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			REVERE PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M3	3AG	1 1/4A 250V S/B P/T	A176-1		3151.25 (3AG 1 1/4A 250V S/B)		MDV 1 1/4	

MISCELLANEOUS

ITEM No.	PART NAME	REVERE PART No.	NOTES
M4	Switch	A141-38	Function Selector (Slide Type)
M5	Switch	A141-39	Equalization (DPDT Slide Type)
M6	Switch	A141-23	Speaker (SPDT Slide Type)
M7	Switch	A141-32	Tape Cut-Off